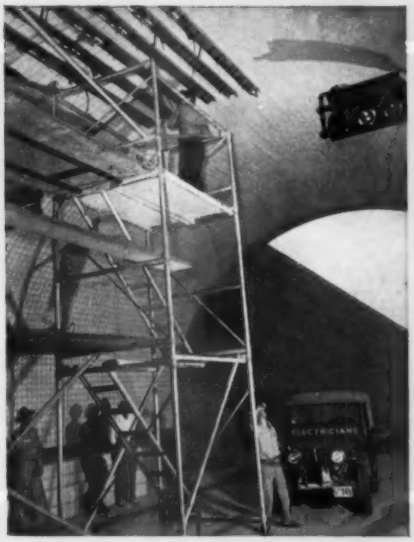
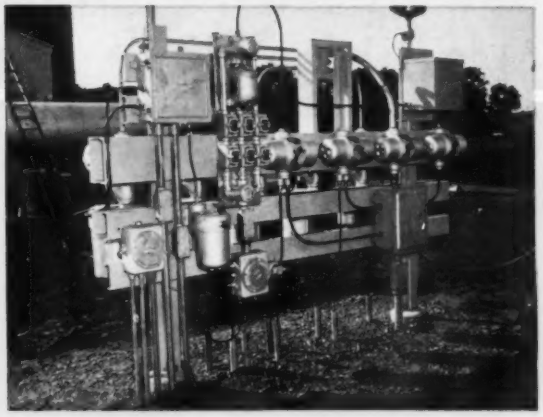
AUGUST • 1955
PRICE 35 CENTS

ELECTRICAL CONSTRUCTION AND MAINTENANCE

WITH ELECTRICAL CONTRACTING





A McGRAW-HILL PUBLICATION 54TH YEAR

one plant...

one product...

the best...

Friction, Rubber Splicing
and Plastic Electrical Tapes *

ACCURATE

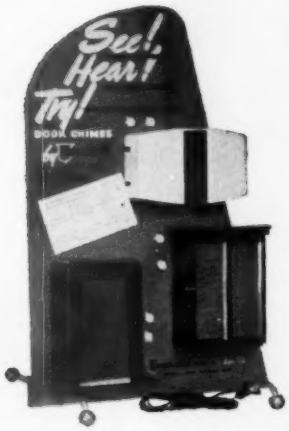
MANUFACTURING COMPANY

GARFIELD, NEW JERSEY

* OUR NEW CATALOG #47 WILL BE SENT ON REQUEST.

NEW EDWARDS CHIME DISPLAYS

for impulse sales!



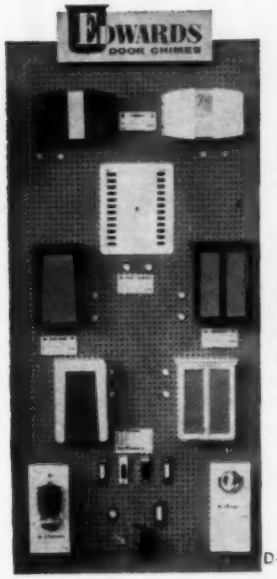
3 best sellers in a striking counter display for heavy traffic spots! D-308 includes C-15, C-21, C-23 with buttons and transformers. Just plug in. Retail, $26.80 . . . your price, $18.06. FREE! C-16!

for builders' sales!

Shows neat look of Hideaway. Highlights easy installation, slim design. Illustrates recessed feature. Complete with chime, transformer, pushbutton. Just plug in. Display includes two extra Hideaway chimes for stock. Retail, $32.79. Your cost, $19.67.

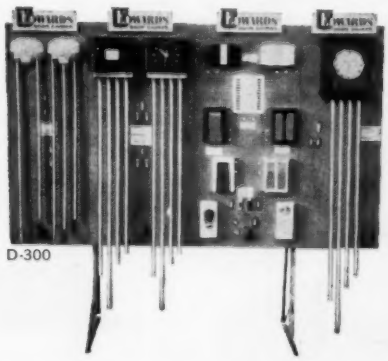
ORDER THEM TODAY.

flexibility . . . for your fixture room!



D-303

Small-chimes-and-pushbutton display (D-303) commands attention! 48" high. Can be used alone—as above. Or combined with any or all of D-301, D-302, D-304. (All 4 together make up D-300, below. Your cost, $206.39. FREE! C-20, C-21, C-22, C-23!) D-303 is a versatile performer! Mount it . . . alone or in combination . . . in corners, around pillars, on walls, on floor (with steel legs). With transformers, cords, plug. Your cost, $47.76. FREE! C-20.



D-300

EDWARDS COMPANY, INC.

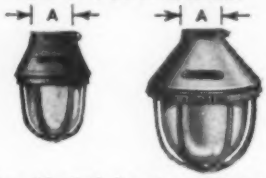
Norwalk, Conn. In Canada: Owen Sound, Ontario

Relamp or Convert to Higher Wattages in **SECONDS...**

with APPLETON vented Explosion-Proof Fixtures

Patent Applied For

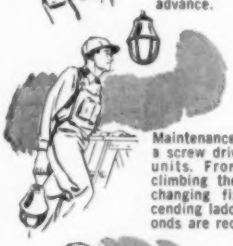
APPLETON INTERCHANGEABLE UNILET BODY FEATURE



Note how identical diameters "A" at top of Dome Unit Assembly permit mounting of all fixtures regardless of wattage.

58 SECOND RELAMPING

When the call comes for relamping, AA-51 Series STAND-BY Units are ready at an instant's notice. Carrying handles can be attached in advance.



Maintenance man needs only a screw driver to exchange units. From the time of climbing the ladder to exchanging fixture and descending ladder, only 58 seconds are required.

Burned out lamps and cleaning fixture are safely attended to at the work bench, while production schedules are maintained.

Standardized Unilet Body Permits 58 Second Interchange of 60 Watt to 500 Watt Fixtures . . . Saves Time, Prevents Shutdowns! All of your customers, in whose plants there are hazardous areas, will appreciate you telling them about *Appleton* AA-51 Series Vented Explosion-Proof Fixtures.

No other similar units have so many exclusive features . . . offer so much. In fact, less efficient units now in use cost your customers real money, in many ways, each day they remain in service.

Appleton AA-51 Series meet all Underwriters' Laboratories requirements for Class I, Groups *C* and *D* Hazardous Locations.

Here is a genuine profit opportunity for you! Write for Full Details, Today!

- **"FLAME-TIGHT" CONTACT CHAMBER** — Because of *Appleton's* exclusive "5-Thread Safety Chamber" any AA-51 Series Unit can be serviced with complete safety even if current is inadvertently left on!
- **"FULL-CIRCLE" VENTING** — The notched globe ring and the porous metal interior dissipate heat evenly and safely and keep fixture temperature cool enough to prevent igniting explosive gases.
- **"STAND-BY" SYSTEM SAVES MONEY** — For every ten AA-51 Units in operation *Appleton* recommends one unit as a stand-by . . . ready for relamping or wattage conversion in 58 seconds.

Sold Exclusively Through Selected Wholesalers

APPLETON ELECTRIC COMPANY
1704 Wellington Avenue • Chicago 13, Illinois

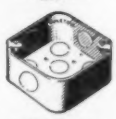
APPLETON ELECTRIC PRODUCTS — REG. U.S. PAT. OFF.

Also Manufacturers of:

Malleable Iron Unilet Fittings

Industrial Lights

"ST" Series Connectors



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Published for electrical contractors, industrial electricians, engineers, consultants, inspectors and motor shops. Covering engineering, installation, repair, maintenance and management, in the field of electrical construction and maintenance.

ELECTRICAL CONSTRUCTION AND MAINTENANCE

with which is consolidated Electrical Contracting, The Electragist and Electrical Record . . . Established 1901

54th Year **AUGUST • 1955**

MORE

AUGUST • 1955 *continued*

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Sidelights

ATOMIC POWER–The first commercial power derived from a nuclear reactor went out over the Niagara Mohawk system on July 18. A prototype submarine reactor in experimental operation at West Milton, N. Y. produced steam to drive a turbine-generator which sent 10,000 kw out over the utility lines.

The AEC, U. S. Navy, General Electric and Niagara Mohawk cooperated to produce this historic demonstration of the peaceful uses of atomic energy. The two historic ceremonies were held on the same date as the opening of the "summit" conference at Geneva.

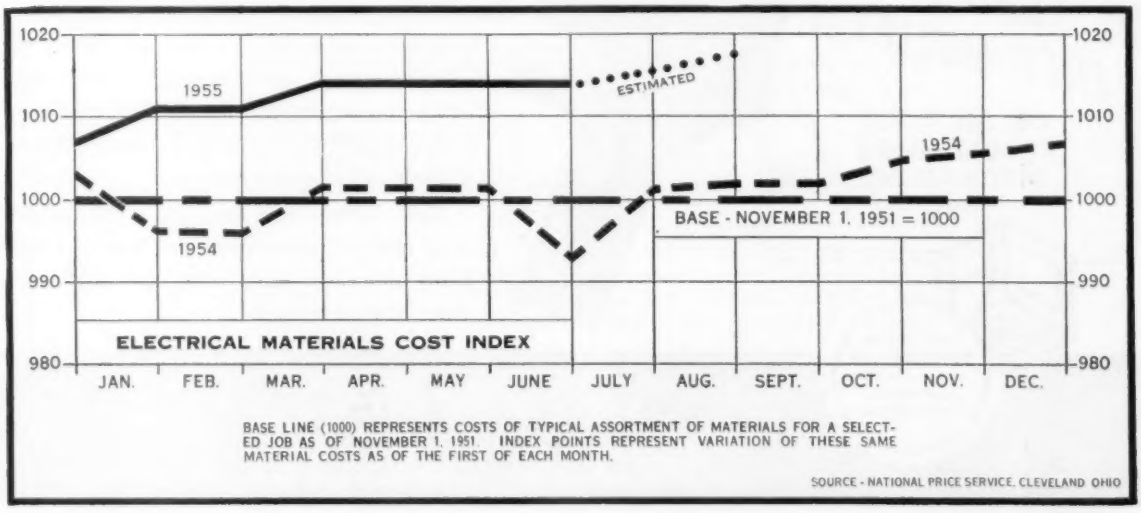
Besides its political and historic significance, West Milton also demonstrated how atom-derived electricity instantly combines in the system with power from other sources. There are now six atomic-electric power plants planned and under construction. As these, and many more, reach completion and go on the line, there will be no detectable difference at the outlet.

As we pointed out in an editorial earlier this year (February 1955, page 65), "The larger public benefits of power from the atom are most likely to come from the entirely pedestrian job of load building that it will inspire. We must learn how to apply and use electricity abundantly, for many tasks and services which may appear impractical or even visionary today, before we can realize the true potential of this elementary energy of the universe".

HOME WIRING IDEAS–A model home in a new residential subdivision in Elmhurst, Ill. has been equipped to demonstrate modern electrical conveniences. Besides the all-electric, all built-in kitchen appliance array, the model home includes an intercom system and many built-in lighting methods with dimmer controls. "Electrical Ideas to Sell the Home Owner" beginning on page 72 will suggest many opportunities for "plus" business on your residential jobs.

TEXAS TUNNEL–Typical of many modern tunnels throughout the country, the Baytown-LaPorte Tunnel near Houston, Texas, is thoroughly electrified for light and power. Details of the design, layout and installation of the electrical system are given in the story "Electrical Work in a Tunnel", beginning on page 65. From its dual overhead-underground 12-kv service feeders to the special layout and design of the tunnel lighting system, this job represents the work of one of the country's leading tunnel engineering firms–Parsons, Brinckerhoff, Hall and MacDonald. The story is told here by Larry Schwing, young and capable superintendent on the job for Muhl Electric Limited, electrical contractors in Houston, Texas. Unusual features of the distribution and circuiting are highlighted in diagrams and photos. The type of installation methods used are also shown.

CUSTOM LIGHTING–An unusual custom lighting installation was recently made in the auditorium of the Esso Research Center, Standard Oil Development Company, Linden, N. J. Here, recessed plastic-shielded fluorescent units were designed to complement architectural features of the auditorium ceiling. This installation, made by Joseph J. Tomasulo & Co., electrical contractors and engineers, Roselle Park, N. J., is actually the first part of a two-part relighting job in the auditorium. The second part of the job will consist of the installation of fluorescent dimming equipment. The circuiting and layout of the luminaires took the future additions into consideration. Remote ballast housings in a special ventilated room add another interesting feature to the job. Design, layout, installation and circuiting details are given in the story about the job–"Custom Lighting in an Auditorium" on page 75. This story clearly shows how custom design of lighting can effectively meet just about any set of lighting requirements.



BASE LINE (1000) REPRESENTS COSTS OF TYPICAL ASSORTMENT OF MATERIALS FOR A SELECTED JOB AS OF NOVEMBER 1, 1951. INDEX POINTS REPRESENT VARIATION OF THESE SAME MATERIAL COSTS AS OF THE FIRST OF EACH MONTH.

SOURCE - NATIONAL PRICE SERVICE, CLEVELAND OHIO

Washington Report

The business outlook has never been rosier, judged by practically all the economic indicators. Employment is greater than ever before, unemployment is down, personal income is at record peak, building construction is setting new records monthly, cost-of-living is steady, and there is an easier feeling about international problems following the "Big 4" meetings at Geneva last month. In fact, the outlook is so good that it is causing some economists to ask if our phenomenal rate of growth may bring on a decline. Others point out that our basic economic strength, some industry readjustments, and tighter credit are expected to keep the current boom healthy.

Construction activity is outperforming the most optimistic estimates of last January's forecasters, and was up 14% above 1954 rate for the first half year period. Spending for this period totaled $19.1 billion, with a record $3.8 billion put in place in June. Private funds financed $2.6 billion of work, and public funds accounted for $1.2 billion—both new peaks.

Construction this year will reach an unprecedented $41.8 billion, Depts. of Commerce and Labor estimate, which is about $4.2 billion above the 1954 level. They expect home building to set a new record of $14.6 billion, for a 21% increase in the previous dollar value record, set in 1954. Church building will account for one of the largest increases, or 26% over last year, according to the forecast.

A state-city public works backlog of $205.5 billion, or over $20 billion a year for the next ten years, are needed according to a recent Dept. of Commerce study and constitutes "a strong stabilizing force for the economy" during this period ahead, it was reported.

Home building forged ahead at an annual rate of over 1.3 million starts during the first half of this year, near 1950's record peak of 1.4 million units. Commerce Dept. credits five factors for this sustained boom: easy credit; ample supply of mortgage money; rising incomes; an increasing and shifting population; and a general desire for bigger and better homes.

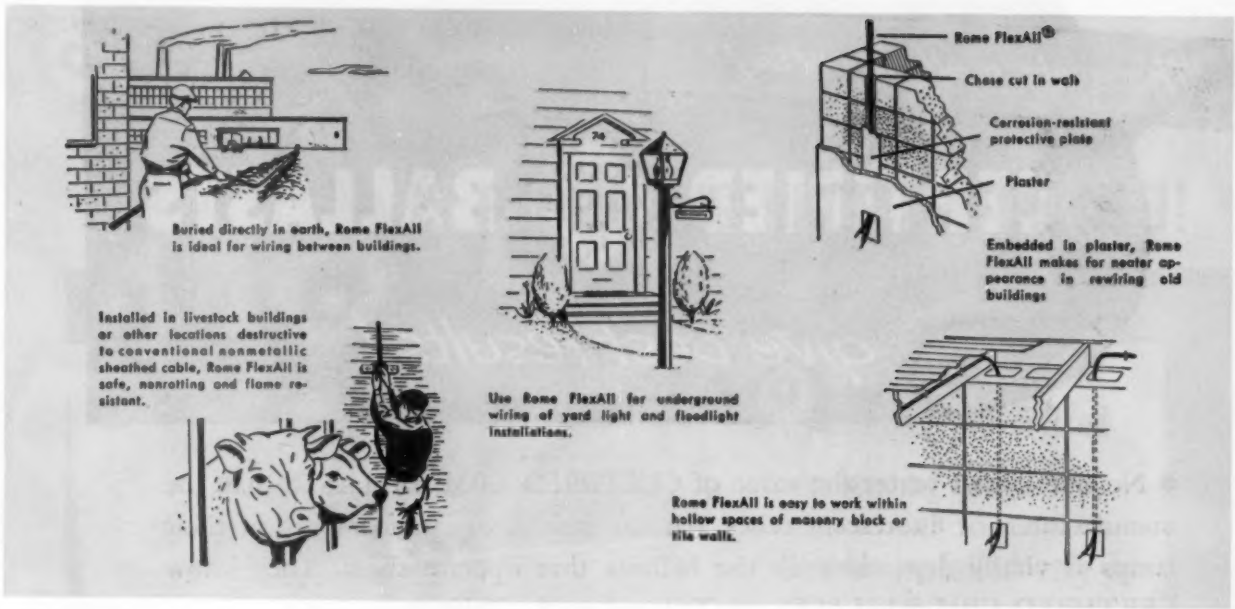
Housing starts in June were 129,000, or 2% below May's 132,000, but still 11% higher than starts in June 1954, BLS reported. The slowdown occurred in a few cities only, while activity held up in other areas. Most builders think homebuilding will pick up again this month, per usual custom.

Apprehensions of overbuilding, which have come from some economists, bankers, and others, should be dispelled by results of a recent survey of the housing market, made by the Commerce Dept., which indicated a vacancy rate of 2.2% of all housing.

Electric power output hit new records almost weekly during June and July, as excessively warm weather over most of the nation increased power consumption for air-cooling and refrigeration on top of a mounting demand needed for continued high industrial production. Output averaged about 15% over the year-earlier totals, with consumption for week ended July 16 at a record high of 10.44 billion kwhr. Current AEC power demands are estimated to be about 8.5% of total output, or about double its year-ago demands.

Electric power needs in case of another war are now under study by ODM. When completed, it may add billions of dollars of new power plant construction to the government's present goal of 150 million kw of installed capacity by the end of 1958. Installed capacity by the end of 1955 will be about 116 million kw.

Build sales volume profitably with this



U/L approved multi-purpose cable

Distributor and contractor alike profit by recommending Rome FlexAll, thermoplastic nonmetallic sheathed cable. Low cost and versatile in application, it is *today's* wiring material for industrial, commercial, farm and residential branch circuits.

FlexAll leads to increased sales volume because it is neat appearing, easy to work and *assures safety* where conditions of moisture and corrosion are present. Designed for multi-purpose use, it is equally suitable for underground circuits buried directly in earth, or the interior wiring of wet and corrosive locations.

Specifically, FlexAll is recognized by the National Electrical Code for the following types of installation:

Single Conductor—Underwriters' Approved as Type UF

- For branch or feeder circuits buried directly in earth, when provided with over-current protection.

Multiple Conductor—Underwriters' Approved as Type UF and NMC

- For branch or feeder circuits buried directly in earth, as above.
- For interior wiring, either exposed or concealed, in dry, wet or corrosive locations.
- For installation within hollow spaces of outside or inside masonry block or tile walls.
- For embedding in plaster or shallow chase in masonry, when suitably protected.

Rome FlexAll is part and parcel of today's modernization trend. Developed primarily for the safer wiring of farm buildings, it leads to the vast potential of that market. With its dual approval for direct-in-earth burial, it is ideal for a host of outdoor lighting applications . . . rural, industrial, commercial and residential. In addition, there is a growing demand for it in the wiring of food processing plants, dairies, breweries, packing houses, cold storage and ice plants . . . anywhere that moist and corrosive atmospheres prevail. FlexAll has exceptionally long life exposed to air containing salt, smoke or humidity. Are you getting your share of this sales volume?

Yes, you can build sales volume *with profit*, with Rome FlexAll and here are some of the reasons:

- It permits smaller inventory—one type of wire for a number of applications.
- It works easily—saves on-the-job time.
- It creates customer satisfaction—is neat appearing and pleasant to handle.
- It has long life.
- It is safe and, therefore, a factor in fire prevention, particularly in rural areas.
- It is nationally advertised and approved as a multi-purpose wiring material.

Rome FlexAll is insulated and sheathed with Rome Synthinol, thermoplastic compound. In the two- and three-conductor types the individual conductors are wrapped with glass fibers. Its entire construction, therefore, is inorganic with nothing to rot or deteriorate. Further, FlexAll resists flame, moisture and abrasion.

Single-conductor Rome FlexAll is manufactured in sizes 4 AWG through 14 AWG. Standard color is black. Two- and three-conductor types are manufactured in sizes 10 AWG through 14 AWG. Standard color is pearl gray. Two-conductor sizes are made with and without ground wire.

If you are not already selling and installing Rome FlexAll, write or phone your nearest Rome Cable representative for Bulletin UF-1. It is yours for the asking.

It Costs Less to Buy the Best

ROME CABLE Corporation
ROME · NEW YORK
and
TORRANCE · CALIFORNIA

Full-Color Movie Tells Dramatic Story of Cable

CABLE PATHWAY OF POWER. A 45-minute feature film in sound and color, 16mm. Now available for showings to technical personnel. Write Rome Cable Corporation, Rome, New York, for bookings.

Those who really know say:

CERTIFIED CBM CERTIFIED by ETL BALLASTS

give best results!

● No one knows better the value of CERTIFIED CBM BALLASTS than the manufacturers of fluorescent tubes. For the satisfactory performance of their lamps is vitally dependent on the ballasts that operate them. They know CERTIFIED CBM BALLASTS are Tailored to the Tube.

CHAMPION *says:*

"Fluorescent lamps are designed to operate at specific electrical values. The use of auxiliary equipment that has been proven to meet these agreed upon standards will assure the user maximum value for his lighting dollar with a minimum of operational failures. Certified Ballasts are inexpensive insurance."

GENERAL ELECTRIC *says:*

"The life and light output ratings of fluorescent lamps are based on their use with ballasts providing proper operating characteristics. Ballasts that do not provide proper electrical values may substantially reduce either lamp life or light output, or both. Ballasts certified as built to the specifications adopted by the Certified Ballast Manufacturers (CBM) do provide values that meet or exceed minimum requirements. This certification assures the lamp user, without individual testing, that lamps will operate at values close to their ratings."

SYLVANIA *says:*

"The light and life ratings of fluorescent lamps are based on three hour burning cycles under specified conditions and with ballasts meeting American Standards Association specifications. Ballasts marked with the CBM emblem and certified by Electrical Testing Laboratories, Inc., meet ASA specifications."

WESTINGHOUSE *says:*

"Use ballasts that are tested and Certified by Electrical Testing Laboratories or ones that are otherwise known to meet the specifications of the lamp manufacturer. These will give best results with Westinghouse fluorescent lamps."

That's why CERTIFIED CBM BALLASTS merit the slogan—Tailored to the Tube.

Certified CBM Ballasts are built to assure quiet operation and long trouble-free life.

CERTIFIED BALLAST MANUFACTURERS

Makers of Certified Ballasts for Fluorescent Lighting

2116 KEITH BLDG., CLEVELAND 15, OHIO

NEW BULLDOG *Electrostrip* PATENTED
IS PROMOTING PROFITS FOR YOU!

Nationally advertised in leading magazines.

Can be installed only by qualified electrical contractors.

Millions of AMERICAN HOME readers will see this ad in August. Millions more will see it in the next issues of HOME MODERNIZING and SMALL HOMES GUIDE. It's just the start of a powerful program to bring you additional business—additional rewiring profits.

This month BullDog goes national with Electrostrip®—the new molding that's *every inch an outlet!*

In powerful, colorful, full-page ads, millions of homeowners will be alerted to the convenience of outlets that *move*. And they'll be told emphatically that Electrostrip can be purchased and installed *only* by their electrical contractor.

You can see the opportunities. Over 40 million American homes need rewiring—and Electrostrip is the modern answer.

And it's so easy to install. No breaking into plaster or wire-fishing. No hidden obstacles in walls to throw off estimates, cost *you* money. Just mount Electrostrip on the baseboard or above . . . tap into any existing wall outlet . . . the job's done before you know it.

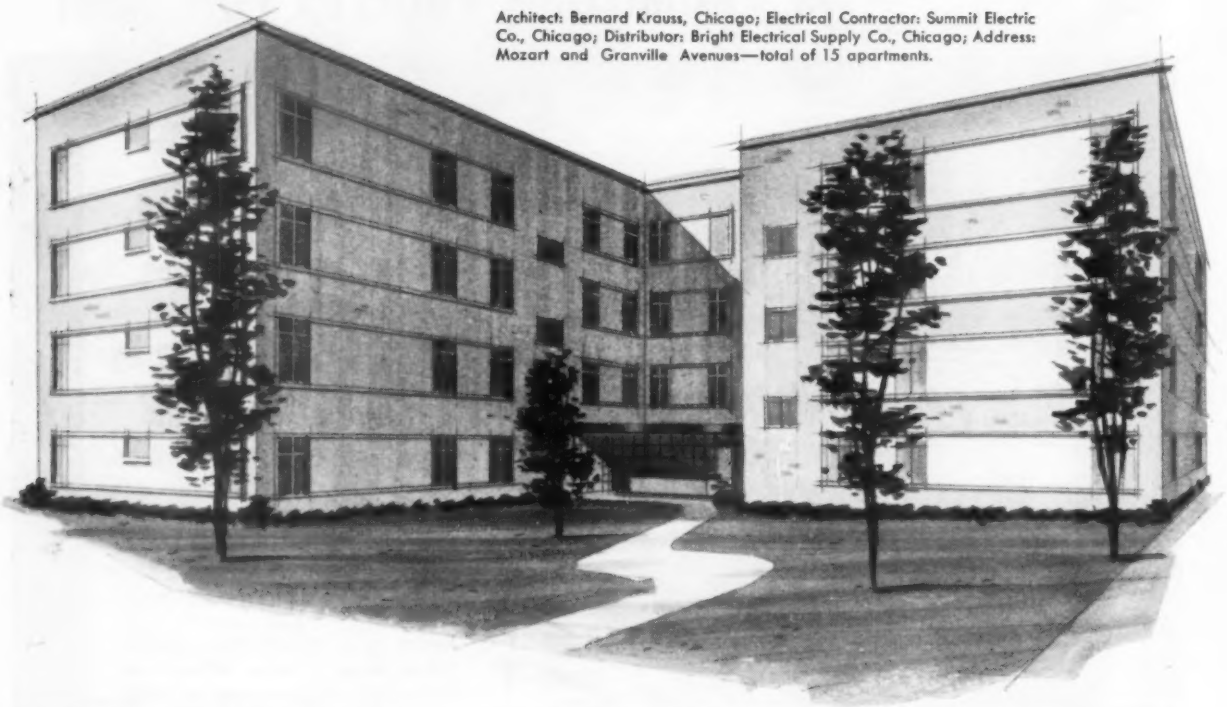
Take advantage of BullDog's advertising program now. Upgrade your rewiring jobs with Electrostrip—and up your profits. See your BullDog Distributor, or write BullDog Electric Products Co., Detroit 32, Mich., for all the facts.

IF IT'S NEW . . . IF IT'S DIFFERENT . . . IF IT'S BETTER . . . IT'S

BULLDOG
ELECTRIC PRODUCTS COMPANY
A Division of I-T-E Circuit Breaker Company

Export Division: 13 East 40th Street, New York 16, New York. *In Canada:* BullDog Electric Products Company (Canada), Ltd., 80 Clayson Road, Toronto 15, Ontario.

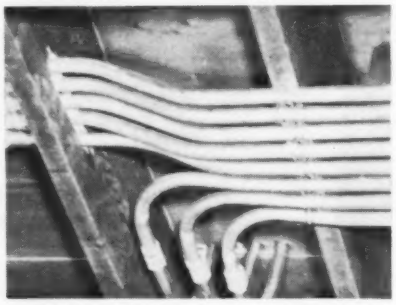
From Start to Finish, Save with



Architect: Bernard Krauss, Chicago; Electrical Contractor: Summit Electric Co., Chicago; Distributor: Bright Electrical Supply Co., Chicago; Address: Mozart and Granville Avenues—total of 15 apartments.

When matched with reference marks on the bender, "Inch-Marks" and Guide-Line on Republic E.M.T. assure consistently accurate bends.

Neat, multiple-run installations are no problem with ELECTRUNITE Electrical Metallic Tubing. Planned runs can be followed with ease.



REPUBLIC STEEL CORPORATION
212 East 131st Street
Cleveland 8, Ohio

REPUBLIC STEEL

Please send me more information on:

☐ Republic "Inch-Marked" E.M.T.

Name_____ Title_____

Company_____

Address_____

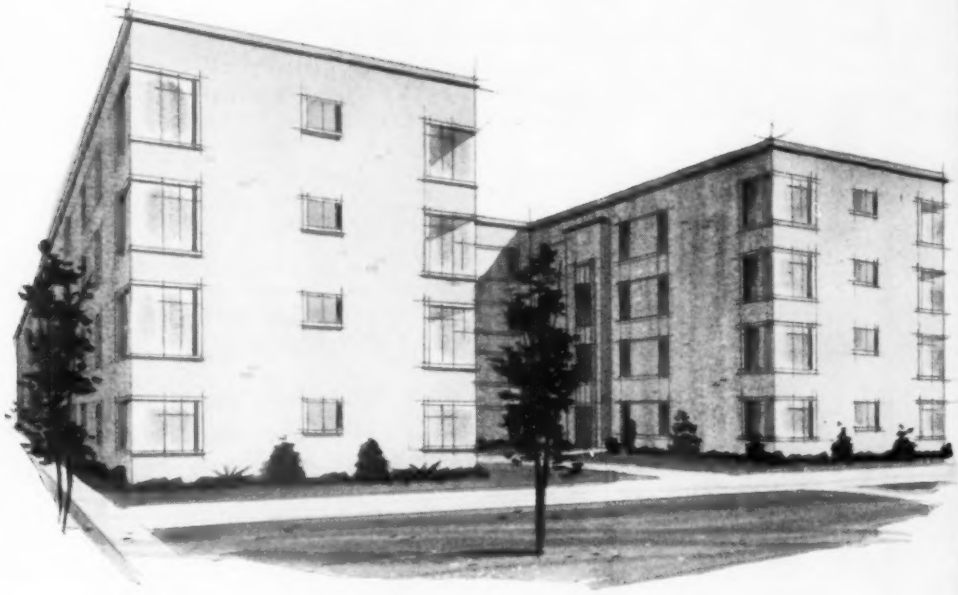
City_____ Zone____ State_____

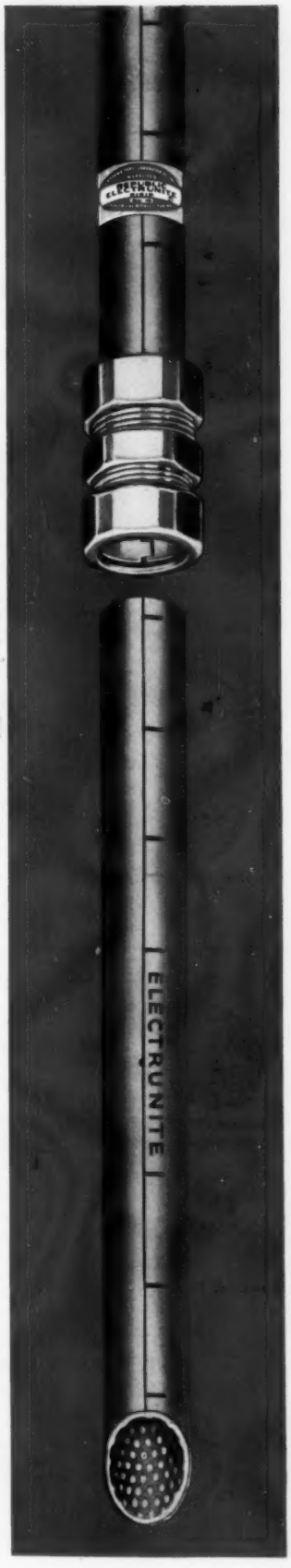
K-3939

Box connectors and couplings make tight connections. They require no thread cutting, no turning of entire runs.

"Inch-Marked" E.M.T.

Architect: Bernard Krauss, Chicago; Electrical Contractor: Maron Electric Co., Chicago; Distributor: Bright Electrical Supply Co., Chicago; Address: Seeley and Fargo Avenues—total of 22 apartments.





WHOSE E.M.T.? Republic's ELECTRUNITE®, of course, because Republic alone makes "Inch-Marked"® E.M.T.—used throughout these two new Chicago apartments.

WHY ELECTRUNITE? Because ELECTRUNITE goes in with maximum ease at minimum cost. Ease of installation is designed in through such exclusive features as "Inch-Marks", Guide-Line, Inside-Knurling . . . features you positively cannot get in any other raceway product, regardless of brand.

WHAT'S "INCH-MARKING"? "Inch-Marks" are printed along each length of ELECTRUNITE E.M.T., showing length in both feet and inches. You need only measure the run, not the raceway, and cut at the right "Inch-Mark". And, when "Inch-Marks" are matched with reference marks on the bender, accurate bends are easy.

WHAT'S "GUIDE-LINE"? The printed Guide-Line on ELECTRUNITE E.M.T. lines up with arrows on the new Republic bender to assure in-line bends every time . . . right on the job.

SO? So add the benefits of "Inch-Marks" and Guide-Line to Inside-Knurling for easier fishing and wire-pulling . . . to high ductility for smooth, easy bending . . . to connectors and couplings which eliminate thread cutting and turning of entire runs . . . and you come up with real savings.

Specify Republic "Inch-Marked" E.M.T. on your next job and you'll get the best run for your money. Meantime, mail the coupon for more information.

REPUBLIC STEEL

World's Widest Range

of Standard Steels and Steel Products

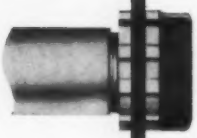
insulined

THE NEW CONCEPT IN FITTINGS THAT REDUCES WIRE PULLING EFFORT UP TO 50%

Insulating Bushing

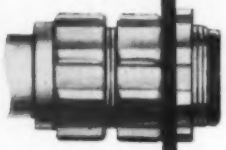
Insulated Metallic Bushing*

Insulated Chase Nipple



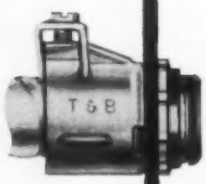
STANDARD RIGID CONDUIT

Insulated EMT Connector



ELECTRICAL METALLIC TUBING

Insulated Tite-Bite Connector — straight



FLEXIBLE CONDUIT OR ARMORED CABLE

Insulated Tite-Bite Connector — 90°

*available soon

Look for the bright blue "insulined"!

ANOTHER NEW T&B ENGINEERED EXCLUSIVE —
The First Line of Self-Insulated Raceway Fittings! Just look at the many benefits you get with these new "insulined" fittings.

They are the *EASIEST* to Install

Factory-assembled, the Insuliner is a permanent part of the fitting — it can never come loose or pull out. The slippery insulined throat cuts pulling effort by as much as 50%.

They make the *SAFEST* Installation

Because of the nationwide accent on safety, the trend is toward insulated fittings in all locations. Insulated bushings are standard fittings today. Extremely tough they are unaffected by common acids, solvents, moisture or fumes.

They make the *MOST ECONOMICAL* Installation

A one-piece fitting makes installation fast and easy for maximum on-the-job savings. There is no need to add a separate insulating bushing.

They give the Installation a *QUALITY LOOK*

Strong, longer bodies and heavy lock nuts . . . 100% visibility . . . accurate threading . . . all of the features you've come to expect in a T&B engineered fitting.

Write for free samples and technical data or contact your nearby T&B Distributor.

LOOK FOR THIS SIGN —

All T&B insuline fittings bear Underwriters Laboratories Approval

IT'S THE MARK OF AN AUTHORIZED T&B DISTRIBUTOR

The complete line of T & B fittings for conductors and raceways is sold only by recognized electrical wholesalers. It's our way of assuring you the service and savings of a friendly local source. Call him for all your electrical needs. T58

THE THOMAS & BETTS CO.

INCORPORATED

34 Butler Street • Elizabeth 1, New Jersey
Thomas & Betts Ltd., Montreal, P.Q., Canada
MANUFACTURERS OF QUALITY ELECTRICAL FITTINGS SINCE 1898

CLASS OF SERVICE
This is a full-rate Telegram or Cablegram unless its deferred character is indicated by a suitable symbol above or preceding the address.

WESTERN UNION

FX-1201

W. P. MARSHALL, PRESIDENT

SYMBOLS
DL = Day Letter
NL = Night Letter
LT = Int'l Letter Telegram
VLT = Int'l Victory Ltr.

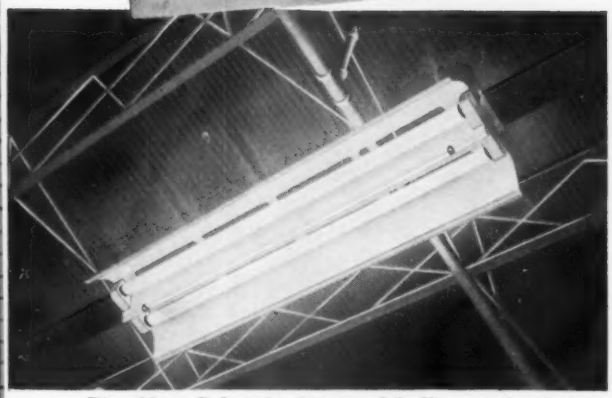
The filing time shown in the date line on telegrams and day letters is STANDARD TIME at point of origin. Time of receipt is STANDARD TIME at point of destination

CT B340 CT.WHA195 NL PD=WUX WHEELING WVIR 18=
JOHN SMITH, PLANT ENGINEER,
PLANT CITY, U.S.A.=

SUGGEST YOU CHECK SYLVANIA'S NEWEST INDUSTRIAL FLUORESCENT FIXTURE... THE "DIAMOND-I". MEETS OR EXCEEDS ALL NEW RLM SPECS. ITS 25% UPWARD LIGHT ELIMINATES SHARP CONTRASTS, REDUCES GLARE. EXCEEDINGLY HIGH 89% EFFICIENCY PUTS MORE LIGHT TO WORK FOR YOU. THIS GIVES YOU BETTER PRODUCTION, LESS SPOILAGE, HIGHER MORALE. SEPARATE 4-FOOT REFLECTORS MEAN ONE-MAN MAINTENANCE REPEAT ONE-MAN MAINTENANCE. WIRE ME COLLECT. REPRESENTATIVE WILL CALL WITH FULL DETAILS=

T. G HEARN, SALES MANAGER - FIXTURES
SYLVANIA ELECTRIC PRODUCTS INC., WHEELING, W. VA.=

THE COMPANY WILL APPRECIATE SUGGESTIONS FROM ITS PATRONS CONCERNING ITS SERVICE



The New Sylvania Diamond-I. Fluorescent fixture features one-man maintenance. Has only 2 major components—lightweight, 4-foot reflector-shield assembly on all units, and one-piece channel assembly.

Perhaps you personally received this telegram which was sent to many of our customers. Because the response was so tremendous, we knew we had something big, new, exciting—a lighting fixture that will set the standard in industry for years to come. If you did not receive the telegram, we reproduce the message here as an invitation for you to learn more about the Diamond-I. Send the coupon below for complete information, or to have a Sylvania lighting specialist call with full details.

SYLVANIA®

... fastest growing name in sight

LIGHTING • RADIO • ELECTRONICS • TELEVISION • ATOMIC ENERGY

SYLVANIA ELECTRIC PRODUCTS INC.
Dept. H-40, One 48th Street, Wheeling, West Virginia

- ☐ Please send me complete information on the new Sylvania Diamond-I Series.
- ☐ Please have a Sylvania lighting specialist call on me with full details.

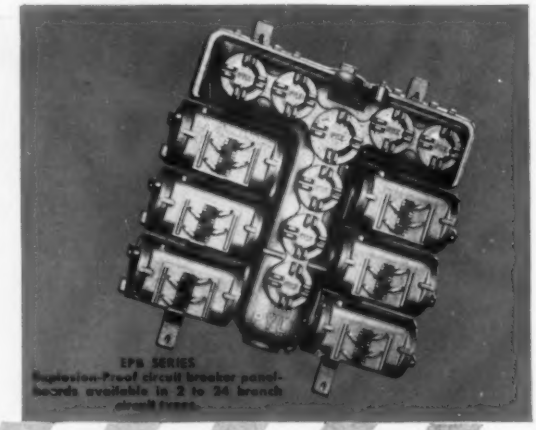
Name_____ Title _____

Company_____

Address_____

City_____ Zone____ State____

SPECIFY...
PYLETS®



FOR HAZARDOUS LOCATIONS

Second to none for...

SAFETY: Explosion-proof and dust-tight PYLETS *exceed* code requirements and provide maximum protection for personnel and property against fire and explosion.

ECONOMY: PYLETS are designed for quick, easy installation and convenient maintenance. Rugged construction insures a long service life.

- TAPER TAPPED HUBS
- SMOOTH, ROOMY INTERIORS
- QUICK ACTING JOINTS
- DEPENDABLE MECHANISMS
- ALUMINUM ALLOY OR HEAVY CADMIUM PLATED FERROUS ALLOY CASTINGS

SINCE 1897

THE PYLE-NATIONAL COMPANY

WHERE QUALITY IS TRADITIONAL

1344 North Kostner Avenue, Chicago 51, Illinois

District Offices and Representatives in Principal Cities of the United States • Canadian Agent: The Holden Co., Ltd., Montreal
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CIRCUIT CONTROLS • PLUGS AND RECEPTACLES • LIGHTING FIXTURES • FLOODLIGHTS

IT'S TRIANGLE

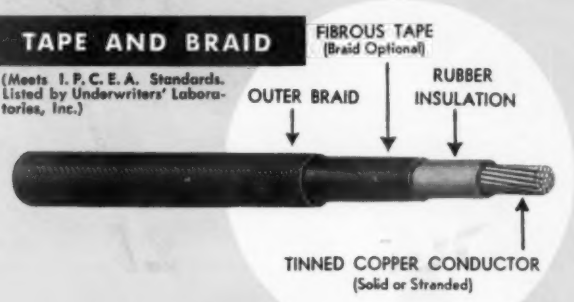
For Rugged, High Quality Power Cables—

All the Way Through!

Don't judge a power cable by its cover alone. If you want *reliability* in high voltage cables, check the complete construction of Triangle Power Cables. You'll find that every protective layer is made of quality materials that give you extra protection, *extra* benefits.

TAPE AND BRAID

(Meets I. P. C. E. A. Standards. Listed by Underwriters' Laboratories, Inc.)

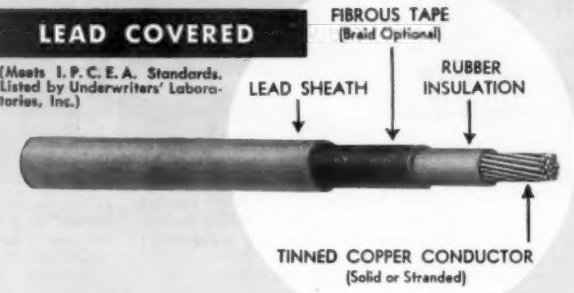


The braid covering on this Power Cable is made from high quality, long staple cotton or glass filament "GLAZON" braid or a combination of both, depending on the size. Underneath this tough braid is a layer of fibrous tape which is substantially as thick as the outer braid itself. This tape is a strong fabric, thoroughly impregnated with a rubber compound.

The insulation on these two cables is Triangle's famous "Adaptal" (Type RH-RW) insulation. This insulation is a high grade rubber, expertly vulcanized. Repeated tests prove that this insulation is far superior to normal insulation in its moisture resistance, heat resistance and long life. It is approved by Underwriters' for service either in wet locations at 60°C or dry locations at 75°C and exceeds Underwriters' specifications for either RH or RW.

LEAD COVERED

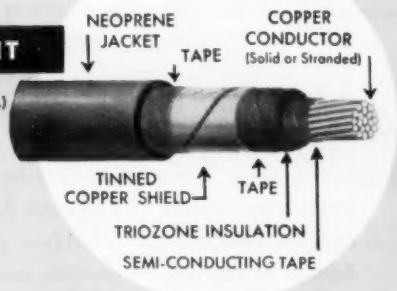
(Meets I. P. C. E. A. Standards. Listed by Underwriters' Laboratories, Inc.)



Where excessive moisture is expected to be encountered, specify Triangle Power Cable with the lead sheath. It affords extra protection against moisture, corrosion and mechanical damage.

OZONE RESISTANT

(Meets I. P. C. E. A. Standards. Listed by Underwriters' Laboratories, Inc.)



Here's the absolute tops in Power Cables. Where high voltages raise the possibility of destructive ozone, Triangle's "Triozone" cable is the answer.

Triozone insulation is a butyl-rubber base insulation that defies ozone and protects the outer neoprene cover.

In many cases a semi-conducting tape is applied over the stranded conductors for further protection.

A tough fabric tape is applied over the ozone-resistant insulation. When required, a tinned copper shield is applied. On top of this is more tape. Then—a special neoprene jacket that is resistant to oil, heat, sunlight, flame and corrosive chemicals.

OTHER POWER CABLES produced at Triangle include — Control Cable — V. C. Interlocked Armor Cable — Parkway Cable — Varnished Cambric — and many others.

It Must Be Right
The Trade Mark of TOP Quality
TRIANGLE ®

TRIANGLE CONDUIT & CABLE CO., INC.

NEW BRUNSWICK, N. J.

Manufacturers of Arteries for Electricity, Liquids and Gases

WIRE • CABLE • CONDUIT • PLASTIC PIPE • BRASS AND COPPER TUBE

look beneath the braid

...that's where quality begins

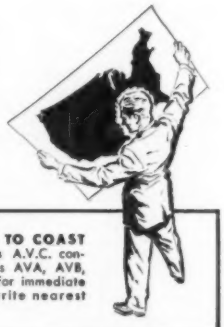
the seamless construction of Rockbestos A.V.C. means lower long-range cost through long, dependable service

Heavy, felted asbestos walls are applied over and under the varnished cambric tapes . . . then thoroughly impregnated ...then the impregnated asbestos is compressed to a dense, homogeneous wall that ensures long cable life.

N.E.C. Type AVA wires or cables may look alike on the surface. But the proof of their quality is *under* the braid. Look for the dense, uniformly-impregnated, seamless walls of *Rockbestos* A.V.C. Type AVA.

The dense, felted, thoroughly-impregnated asbestos walls of *Rockbestos* A.V.C. seal the varnished cambric tapes away from air or moisture. This seamless construction gives *Rockbestos* A.V.C. added strength against damage from flexing. Heat dissipation is uniform. Dielectric strength *stays* high under conditions of high ambient temperature or moisture.

Complete construction and test specifications of *Rockbestos* A.V.C. Type AVA are in the new booklet: "Specifications RSS-88". Write for your copy.



STOCKED COAST TO COAST
Standard Rockbestos A.V.C. construction (N.E.C. types AVA, AVB, etc.) are available for immediate shipment. Call or write nearest branch office.

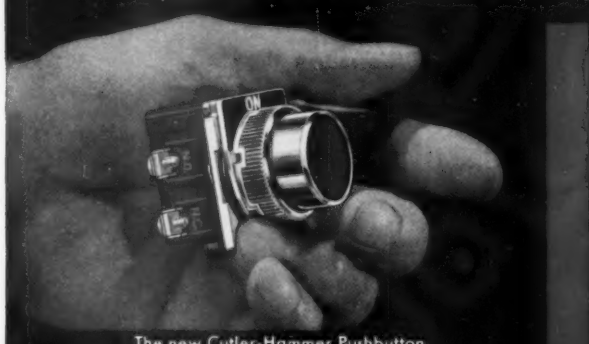
ROCKBESTOS PRODUCTS CORP.
NEW HAVEN 4, CONNECTICUT

NEW YORK • CLEVELAND • DETROIT • CHICAGO • PITTSBURGH • ST. LOUIS • LOS ANGELES • NEW ORLEANS • OAKLAND, CALIFORNIA •

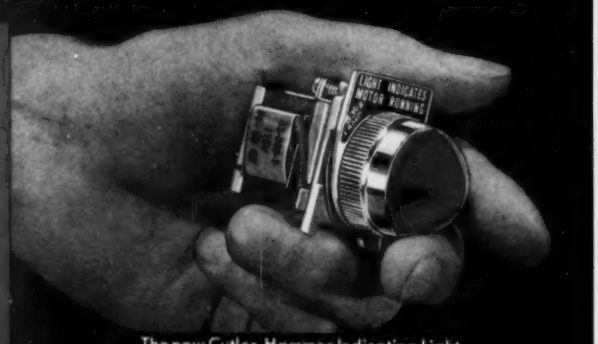
THE NEW CUTLER-HAMMER LINE

OF HEAVY DUTY, OILTIGHT

Pushbuttons, Selector Switches and Lights



The new Cutler-Hammer Pushbutton with double pole contact block that measures only 1 3/32" in depth.



The new Cutler-Hammer Indicating Light with separate winding transformer that measures only 1 9/32" in depth.

New shallow-depth contact blocks; greater freedom of circuit arrangements; better design; better appearance; better performance. Get them first, get them fast, get them *now*.

Once again the name Cutler-Hammer companions great achievement . . . an amazing and unique new line of heavy duty, oiltight pushbuttons, selector switches and indicating lights. There is nothing to compare with it. The feature that stands out above all is the new basic working unit, the contact block—and its counterpart for the indicating lights, the transformer or resistor. *THIS NEW CONTACT BLOCK MEASURES ONLY 1-3/32" IN DEPTH BEHIND THE MOUNTING PANEL.* A fact of amazing consequence for the vast majority of pushbutton users.

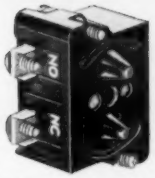
Of even greater consequence is the greater degree of circuit flexibility this new design provides. With its contacts set side by side, "in parallel," electrically isolated from one another . . . *you can apply one voltage on one set, a different voltage on the other. Or you can impress alternating current on one and direct current on the other.* Each pair of contacts has its own actuating plunger; you can throw both simultaneously, or singly or in sequence.

And you can add contact block to contact block, one behind another, easily, simply, swiftly, giving you virtually unlimited circuit possibilities.

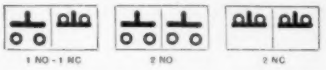
There is a complete range of operators: standard or extended length pushbuttons, with regular or mushroom head; selector switches providing maintained contact or momentary contact with spring return in either or both positions; key operators providing in addition momentary contact that becomes maintained on key withdrawal. Pushbuttons available in 5 colors. All operators are chrome-plated for lasting beauty. Indicating lights have new wide-visibility lenses proved by light-meter reading to be most visible of all from any angle. Lights are available with resistor or separate winding transformer. Transformer type with 6-volt bayonet lamp provides multiplied lamp life where shock and vibration prevail.

These and many other features are fully described and illustrated in a bulletin just published. Write for it today or see the complete line at your nearest authorized C-H distributor. CUTLER-HAMMER, Inc., 1306 St. Paul Ave., Milwaukee 1, Wis. *Associate:* Canadian Cutler-Hammer, Ltd., Toronto, Ont.

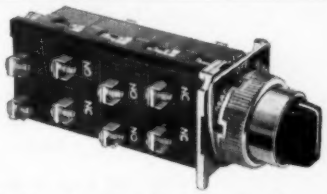
CUTLER-HAMMER
MOTOR CONTROL
C-H



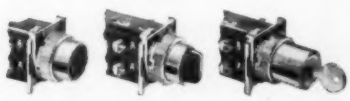
New shallow-depth contact block has electrically isolated contacts, allows different voltage or different current on each pair of contacts.



Three separate contact blocks available; with 1 NO and 1 NC contact; 2 NO contacts; or 2 NC contacts.



Double pole contact blocks mount easily one behind another to provide unlimited circuit combinations.



Every type of operator: pushbutton, selector switch and key operator.

"We save time . . . with Day-Brite"

Messrs. Herman Herbst, Ken Luttermoser and Paul Roepnack, all of Herbst Electric Co., Cleveland, viewing completed installation of Day-Brite aluminum paralouver troffers in the Engineering Department of the new office and plant of Electric Controller & Manufacturing Co., Cleveland.

Herbst Electric Company, Cleveland, is an old and continuing booster for Day-Brite lighting. Commenting on the superior features of this quality line, Mr. Herbst says:

"Our big aim is to give our customers a quality lighting installation. Years of experience have proved to us that we can depend on Day-Brite because their design and construction know-how make it easy for us to turn in a quality job. This means customer satisfaction—our biggest asset.

"Another thing: Their many design features make Day-Brite preferred from an installation standpoint. We save time, and—as the old saying goes—time is money."

NOTE: *In addition to the troffers pictured, Herbst Electric Company installed Day-Brite Luvex ®, Plexoline ®, CFI, Duo-Frame, Rangers and Exit Lights in the Electric Controller and Manufacturing Company office and plant.*

Day-Brite Lighting, Inc., 5402 Bulwer Ave., St. Louis 7, Missouri

Architects: *Arthur E. Rowe & Associates, Cleveland.*
Electrical Engineers: *P. C. Mehnert and C. K. Reid, Cleveland.*

5477

"DECIDEDLY BETTER"
DAY-BRITE
Lighting Fixtures

NATION'S LARGEST MANUFACTURER OF COMMERCIAL AND INDUSTRIAL LIGHTING EQUIPMENT

time switch service calls cut into your profits...

here's the only time switch that doesn't have to be re-set after a power failure!

Only the Sangamo Heavy Duty Time Switch has the electrically-wound Automatic Carryover which keeps it running during a power outage.

Sangamo Heavy Duty Time Switches with automatic carryover never need re-setting after a power failure—unless the power is off for more than 10 hours. Sangamo's exclusive electrically-wound automatic carryover keeps the switch running right on time. You don't even have to rewind the mainspring of the carryover mechanism.

Think of the time and money automatic carryover can save you in terms of service calls to "re-set the clock" —especially if the switch is in a hard-to-get-to place.

An *ASTRONOMIC DIAL* on the Sangamo Heavy Duty models controls switching schedules automatically in exact accordance with sunrise and sunset... you needn't go near the switch... it will turn your installation on at sunset and turn it off at sunrise... all year round... every year.

Your electrical wholesaler can furnish you with all types of dependable Sangamo Time Switches.

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

ST55-5

This Manson Tape is still good —after 28 years!

Mr. C. T. Warren, professional Electrical Engineer of Orange, Texas, has always recommended Manson Friction Tape to his maintenance and construction

crews. Recently he sent us two partially used rolls of Manson which have been in his tool box since 1927.

The photo above, of one of the original rolls, shows this result: *the tape, manufactured 28 years ago, still retains its tackiness and most of its original tensile strength.*

Manson Friction Tape is made of a closely woven cotton fabric, into which has been frictioned only new, naturally tacky rubber compounded with the best chemical ingredients. It is mechanically strong... durable and long-lasting... adheres firmly. Manson breaking strength is over 50 pounds per inch of width, compared to the ASTM requirement of 40 pounds.

Used with Okonite and Okolite Rubber Tapes, Manson makes splices that will be tight and waterproof far longer than ordinary tapes. Write for Okonite Splicing Instruction Folder 1089.

...when you splice with:

AVAILABLE THROUGH AUTHORIZED DISTRIBUTORS ONLY

3172

Made by
THE OKONITE COMPANY
PASSAIC NEW JERSEY
SINCE 1878

SPECIALISTS IN ELECTRICAL WIRES, CABLES AND SPLICING MATERIALS FOR 75 YEARS

which of these feed-in duct features *rate highest with you?*

architects

rate these SQUARE D features particularly high:

lowest known voltage drop . . . maximum efficiency, minimum power loss

smallest cross-sectional area . . . conserves valuable installation space

contractors

give these features top billing:

reduced installation time . . . simplified components, factory prefabrication

new joint design *(lower right)* . . . all joint ends identical, connection bolts face outward

interchangeable standard fittings . . . permit horizontal or vertical riser applications

users

vote these SQUARE D features tops:

low cost installation and maintenance . . . most accessible connections

totally enclosed . . . permanent safety construction, excludes dust

completely reuseable . . . rearrangement with the same components

EXCLUSIVE JOINT DESIGN

SQUARE D's exclusive joint design saves installation time and reduces maintenance cost. Joint ends are identical—unnecessary to select mating ends before positioning or hanging duct sections. Outward-facing, pre-installed bolts permit rapid assembly and easy maintenance.

ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

SQUARE D COMPANY

Set the Scene with

LITECONTROL

for Readin' is easy on the eyes in this schoolroom with the even, high level lighting of Litecontrol Fixture 6628. Note the unusually good end-throw, the smart simplicity. It's 86% efficient, simple to install and maintain.

Restin' takes a load off the eyes, too, in this modern air terminal. Three Litecontrol fixtures make it exceptionally light, yet never bright. Slim 3224 guides traffic in corridors. Counters smile cooperatively with square incandescent lens boxes. While the waiting-room relaxes in the light touches of round, wide-angle lens boxes.

Ritin' is never a strain when the light's right — free from shadows and glare. Litecontrol's *Luminous Ceiling* incorporating Holophane low-brightness lenses provides it here with beauty, efficiency, economy.

'n 'Rithmetic. Litecontrol Fixture 5138 pays off in dollars and sense, as it puts these products in their *best* light. Holophane low-brightness lens prevents unflattering glare. Hinged door frames open or close *at the snap of your fingers,* on exclusive Litecontrol *Trigger Catch* snap-locks.

There's a LITECONTROL Fixture for every scene and situation. You, too, can have "custom" beauty and performance at "standard" prices. Write for catalog and complete information.

LITECONTROL
Fixtures
LITECONTROL CORPORATION
36 PLEASANT STREET, WATERTOWN 72, MASSACHUSETTS

Busway with Alcoa Aluminum Bus Bar

COSTS LESS,

SIMPLIFIES DESIGNS,

PACKS MORE POWER!

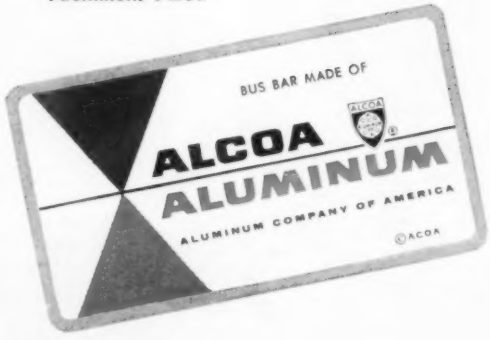
Westinghouse
Bus Duct being fabricated
at its Beaver, Pennsylvania, plant.

This new aluminum busway with Alcoa® *Aluminum* Bus Bar is one-third lighter than copper busway of equal conductivity. It has greater current-carrying capacity, pound for pound, than cable in conduit. It is prefabricated in standard sections . . . installs easily and quickly in any layout.

Alcoa's new No. 2 EC aluminum bus bar was developed to meet the demands of distribution bus for superior properties. It provides the most favorable combination of strength, conductivity, low creep and light weight at a significant saving in cost.

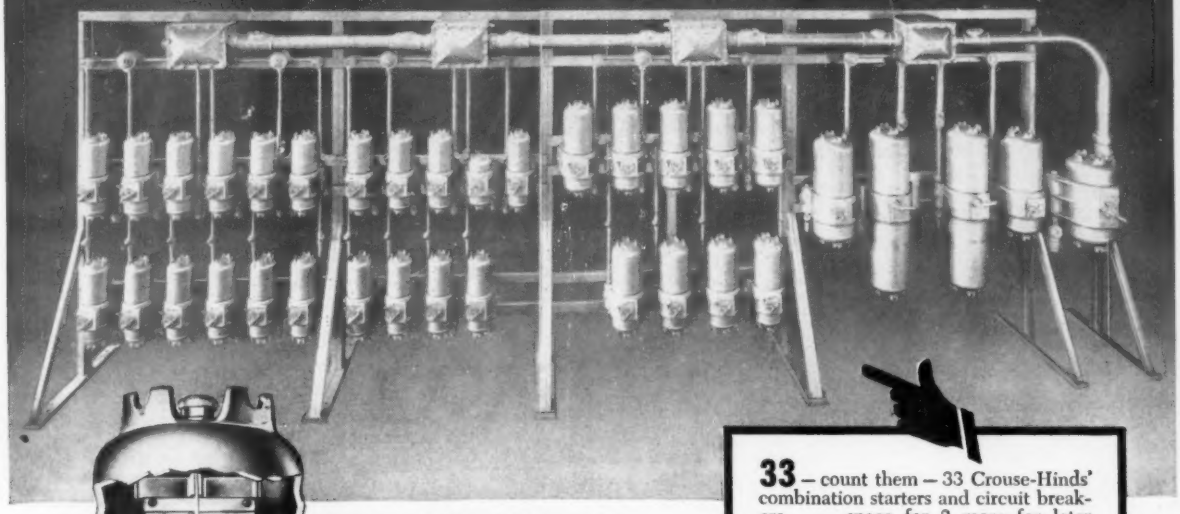
Wherever your production requirements demand an efficient, flexible electrical distribution system, specify busway with Alcoa Aluminum Bus Bar. Aluminum Company of America, 2302-H Alcoa Bldg., Pittsburgh 19, Pennsylvania.

Your Guide to
Aluminum Value

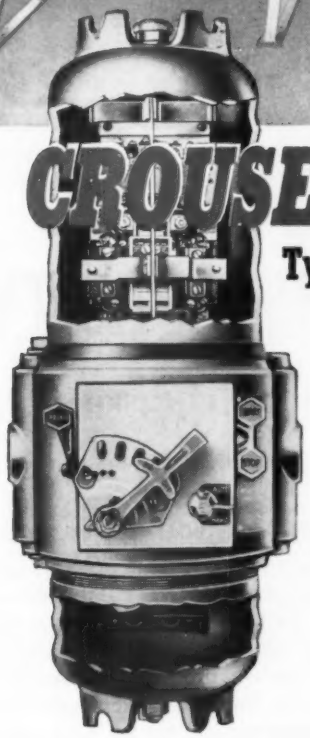


ALWAYS USE ALCOA® ALUMINUM ACCESSORIES WITH ALUMINUM CONDUCTORS

Need more motor controls BUT... haven't enough room?



33 – count them – 33 Crouse-Hinds' combination starters and circuit breakers . . . space for 2 more for later installation . . . plus 2 circuit breakers —all in 28′ x 10′ of space! Conventional single-tiered installation would have required 20 ft. - longer rack and 4 more junction boxes.



CROUSE-HINDS

Type EPC Explosion-Proof MOTOR STARTER and CIRCUIT BREAKER CONDULETS* take up less space!

As in the installation shown above, a given area will hold *more* Crouse-Hinds' motor controls than any other make. You save money on the construction of steel mounting racks – fill your needs without occupying additional premium floor space.

- Explosion-proof, dust-tight, weather-resistant.
- Light-weight cast aluminum for easy installation without lifting equipment.
- Flame-tight threaded joints throughout.
- Seven conduit entrances simplify installation.
- Built-in push button stations and built-in selector switch available.
- Starter sizes 0 to 5. Circuit breakers 50 to 600-amp. frame sizes.

Let Crouse-Hinds help you solve your space problems. Engineering assistance available without obligation.

*CONDULETS are made only by CROUSE-HINDS

A NATIONWIDE DISTRIBUTION exclusively through ELECTRICAL DISTRIBUTORS

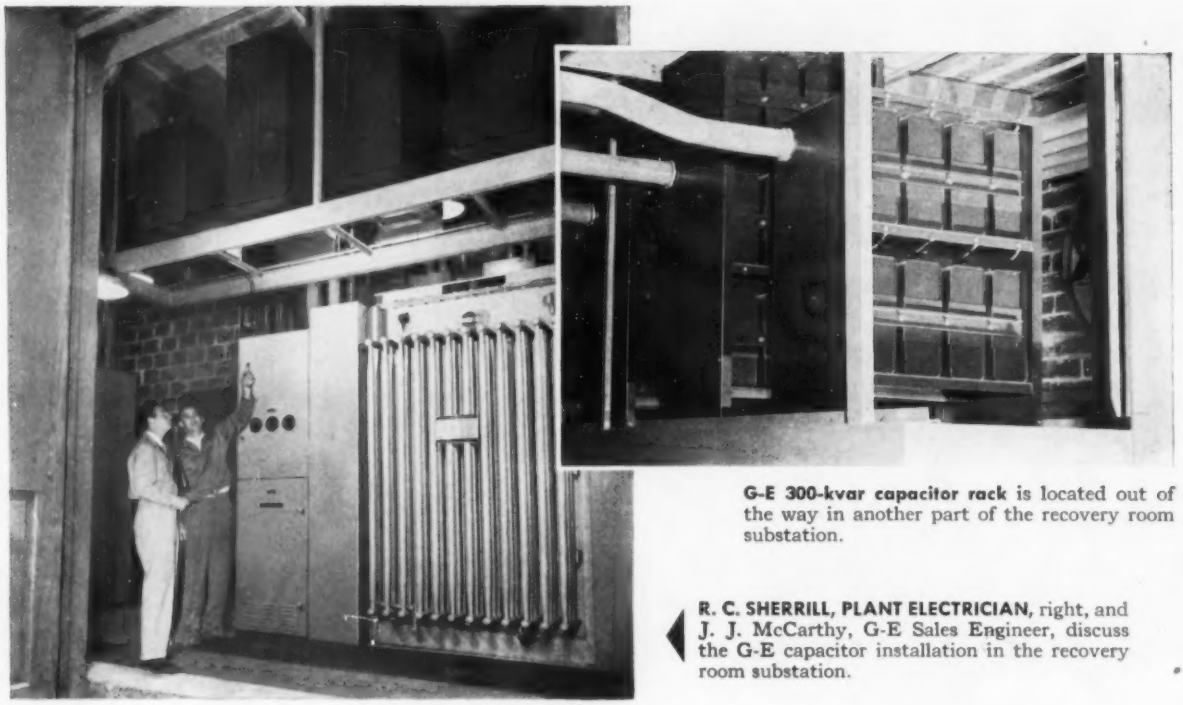
CROUSE-HINDS COMPANY

SYRACUSE 1, N. Y.

OFFICES: Birmingham, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Dallas, Denver, Detroit, Houston, Indianapolis, Kansas City, Los Angeles, Memphis, Milwaukee, New Orleans, New York, Philadelphia, Pittsburgh, Portland, Ore., St. Louis, St. Paul, San Francisco, Seattle, Tulsa, Washington. RESIDENT REPRESENTATIVES: Albany, Atlanta, *Baltimore, * Baton Rouge, Charlotte, Chattanooga, Corpus Christi, Reading, Pa., Richmond, Va., Shreveport

Crouse-Hinds Company of Canada, Ltd., Toronto, Ont.

CONDULETS • FLOODLIGHTS • TRAFFIC SIGNALS • AIRPORT LIGHTING



G-E 300-kvar capacitor rack is located out of the way in another part of the recovery room substation.

R. C. SHERRILL, PLANT ELECTRICIAN, right, and J. J. McCarthy, G-E Sales Engineer, discuss the G-E capacitor installation in the recovery room substation.

G-E CAPACITORS HELP BOOST PLANT GENERATOR AND SUBSTATION CAPACITY

Riegel Carolina Corporation carries additional load with help of capacitors

"Power factor has jumped from 82 to 95 per cent, and we've released 1100-kw capacity to our plant," reports R. C. Sherrill, Plant Electrician for the Riegel Carolina Corporation, Acme, N. C. "As a result, we've released capacity on eleven substations, enabling us to install more bleaching stages in the plant," said Mr. Sherrill.

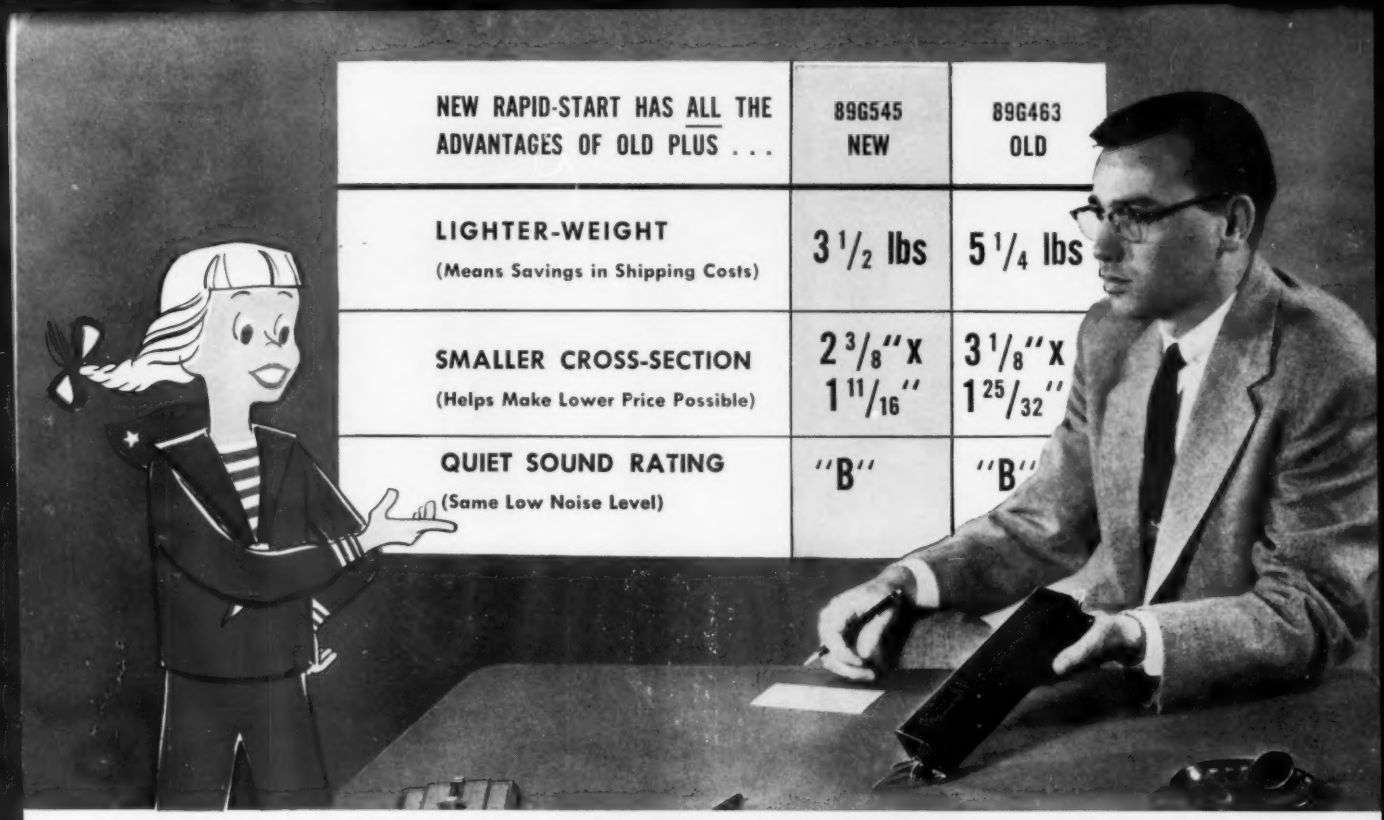
Here is how G-E capacitors helped this company: With mill load peaked, only 1700-kw capacity was available in the present facilities. However, due to various expansion projects mill load was expected to increase by 2800 kw. More substation capacity was needed immediately and shortly the mill's power supply would have to be expanded. With the installation of 3240 kvar of capacitors, substation loading was reduced and 1100 kw of turbine generator capacity was made available.

G-E CAPACITORS CAN SAVE YOU MONEY, TOO!

Whether you buy or generate your own power, low power factor costs you money. General Electric capacitors improve power factor and cut power costs. Also, G-E capacitors can economically supply a needed boost when voltage is a problem. Besides this, G-E capacitors can often increase system capacity without requiring expensive rewiring or additional generating equipment. Find out how you can start saving with G-E capacitors by contacting your nearest G-E Apparatus Sales Office, or write for Bulletin GEA-5632, General Electric Company, Section 441-110, Schenectady 5, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC



FLORA EXPLAINS how the new G-E rapid-start ballast has a smaller brickette cross section while it still retains the same short length of the old brick ballast. There is no increase in heat rise and the new ballast has the same quiet sound rating of "B."

Flora* shows you why . . .

NEW G-E Ballast is 28% Smaller, 33% Lighter; Helps You Save Lighting Dollars

General Electric's ballast design leadership program has produced a new CBM-certified rapid-start ballast that is lighter, smaller, and costs less. G-E ballast engineers, through an ingenious redesign of the core and coil structure, have cut the weight down 33 percent and the cross section dimension by 28 percent. In addition, the new 40-watt rapid-start G-E ballast is easier to connect (it has an extra green lead); substantially reduced in price.

This is progress you can measure; progress that is the result of the intensive and continuing program of ballast design and development engineering. And these new developments will soon be applied to other G-E ballasts.

Next time you specify equipment for a fluorescent lighting installation make sure you get the best . . . specify General Electric ballasts. Look for the G-E ballast tag. For further information on G-E ballasts, write Section 401–17, General Electric Company, Schenectady 5, New York

***Miss Fluorescent Ballast, G.E.'s Ballast Mascot.**

G-E DEVELOPMENT engineer testing the new rapid-start ballast design that does the same ballasting job for less money.

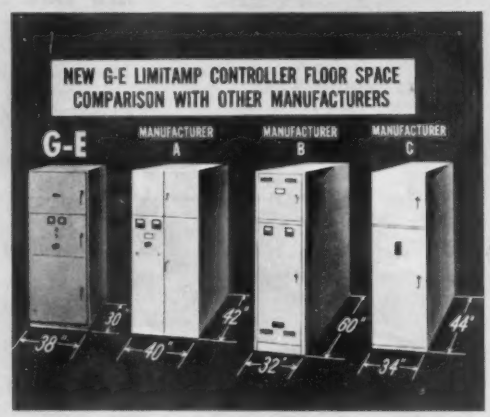
Six reasons why

GENERAL ELECTRIC IS YOUR BEST BALLAST VALUE

- **EXCLUSIVE SOUND RATING SYSTEM**
- **PROVED PRODUCT LEADERSHIP**
- **SUPERIOR QUALITY CONTROL**
- **LONGER BALLAST LIFE**
- **PRECISE LAMP-MATCHED DESIGN**
- **COMPLETE CUSTOMER SERVICES**

Progress Is Our Most Important Product

GENERAL ELECTRIC



356 SQ. IN. LESS area than next smallest starter.

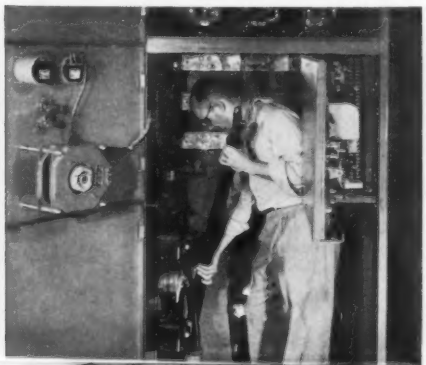
General Electric Announces . . .

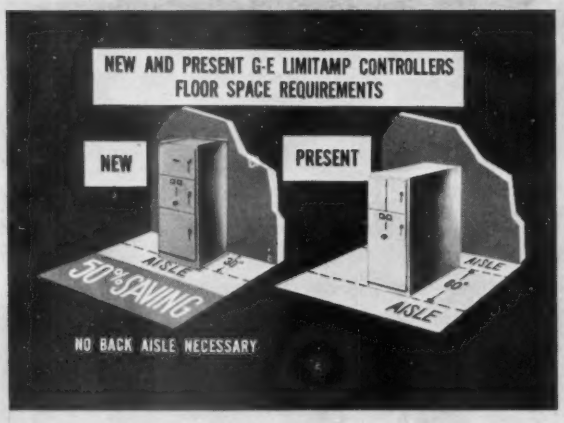
NEW Limitamp*

- **Gang-operated disconnect switch on all units**
- **Entirely front connected**
- **30-inch depth**
- **Low-voltage panel hinged to swing out of enclosure**
- **Contactor rolls in or out of cabinet**

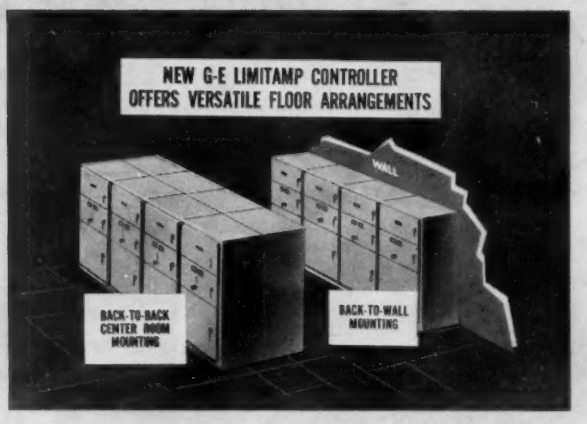
NEW DESIGN

INSTALLATION IS SIMPLIFIED. A man can easily enter enclosure to make connections.





OVER 50% SPACE SAVINGS by elimination of back-aisle.



VERSATILE INSTALLATION—units all front connected.

Control saves over 50% floor space

ENTIRELY FRONT CONNECTED, only 30 inches deep, General Electric's all-new Limitamp control offers versatility of installation. New 30-inch depth allows unit to be transported through normal size doorways, and 90-inch height includes bus compartment. Back-to-back, back-to-wall, or mounting as free standing enclosure is now possible.

IDEAL FOR HIGH-VOLTAGE MOTORS, rated 2300-4800 volts and up to 3000 h-p, the new Limitamp control may be applied to squirrel-cage, synchronous, wound-rotor, and multi-speed motors on power systems requiring high interrupting capacity for maximum short-circuit protection.

NEW CONCEPTS IN SAFETY are built into new Limitamp control. Gang-operated disconnect switch, steel barriers between all compartments, enclosed bus compartment and co-ordination of starter assure you of safer high-voltage motor control.

G.E. LIMITAMP STARTERS are co-ordinated to provide maximum protection for equipment and personnel. Co-ordinated circuit components guard against needless fuse blowing, give running overload protection and provide maximum safe-guard against short-circuit damage for starter and equipment.

FOR COMPLETE APPLICATION ENGINEERING service contact your nearest G-E Apparatus Sales office. Write for Bulletin GEA-6331, Section 781-12, General Electric Co., Schenectady 5, New York.

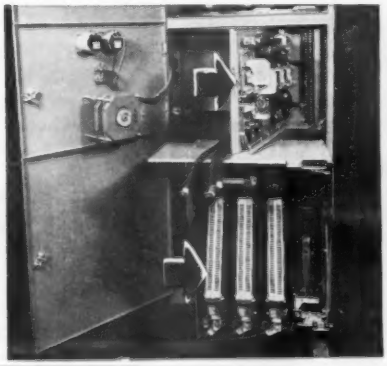
**Trade-mark of General Electric Company*

Progress Is Our Most Important Product

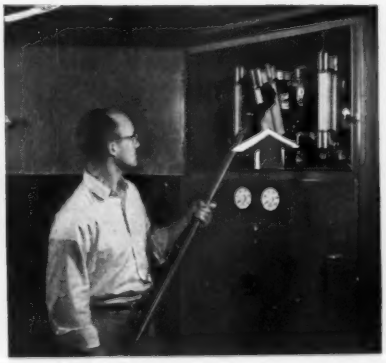
GENERAL ELECTRIC

SIMPLIFIES INSTALLATION AND MAINTENANCE

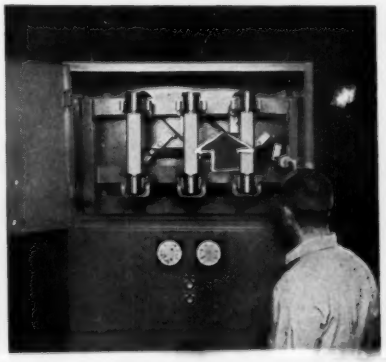
MAINTENANCE IS EASY. Low-voltage panel swings out, contactor rolls out.



TYPE EJ-2 CURRENT-LIMITING fuses are safely, quickly replaced within seconds.



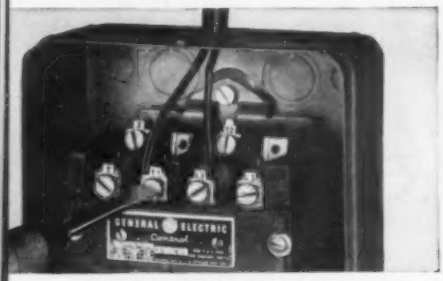
SAFE VISUAL CHECK of disconnect switch with fuse compartment door open.



1 **KEYHOLE MOUNTING** of starter. Slide openings over three screws, and starter is supported while tightening. Enclosure has similar type mounting.

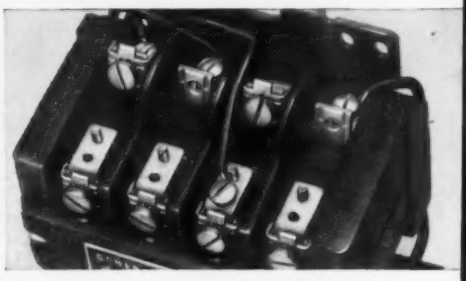
2 **10 COMBINATION KNOCKOUTS** on top, bottom, sides and back. You can use the most direct wiring, and easily adapt starter for all your applications.

3 **WIRING ROOM** is plentiful when starter is mounted in enclosure. Laying wire to terminals and cutting to length are simplified by ample space.

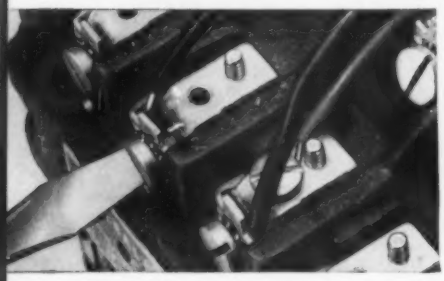


4 **FRONT-CONNECTED WIRING** means all the connections are made after starter is mounted. Terminals are right in front where they are easily reached.

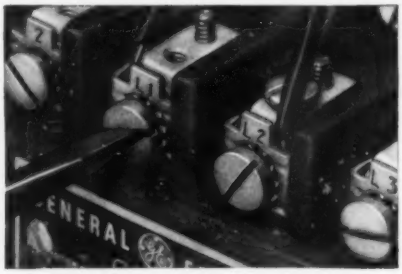
5 **IDENTIFIED TERMINALS** clearly show wiring for the power and load. There is no guessing where a wire is to go, and incorrect wiring is reduced.



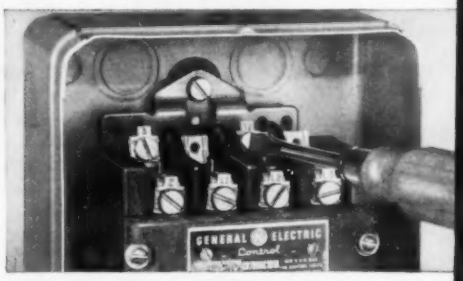
6 **SEPARATE CUSTOMER TERMINALS** mean no factory leads to slip out or take space you need. All the factory wiring goes to separate terminals.



7 **CLAMP-TYPE TERMINALS** make wiring easy. When terminal screw is backed out, clamp follows. Hold stripped wire behind clamp when tightening.



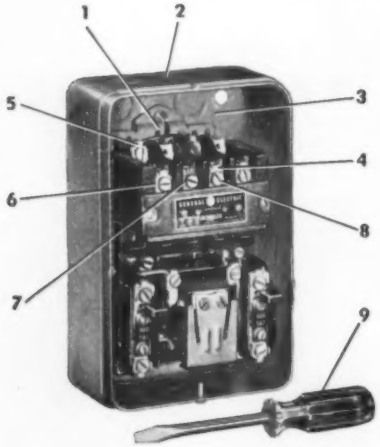
8 **PAN-HEAD SCREWS** have large, deep slots to take full width of screwdriver to help prevent slippage. Hardened head helps prevent burring.



9 **SCREWDRIVER GOES STRAIGHT IN** to all the terminals—nothing is in the way. And, a screwdriver is the only tool that is required for installation.

***9 FEATURES** of G-E Magnetic Starters to . . .*

SPEED INSTALLATION–REDUCE COSTS



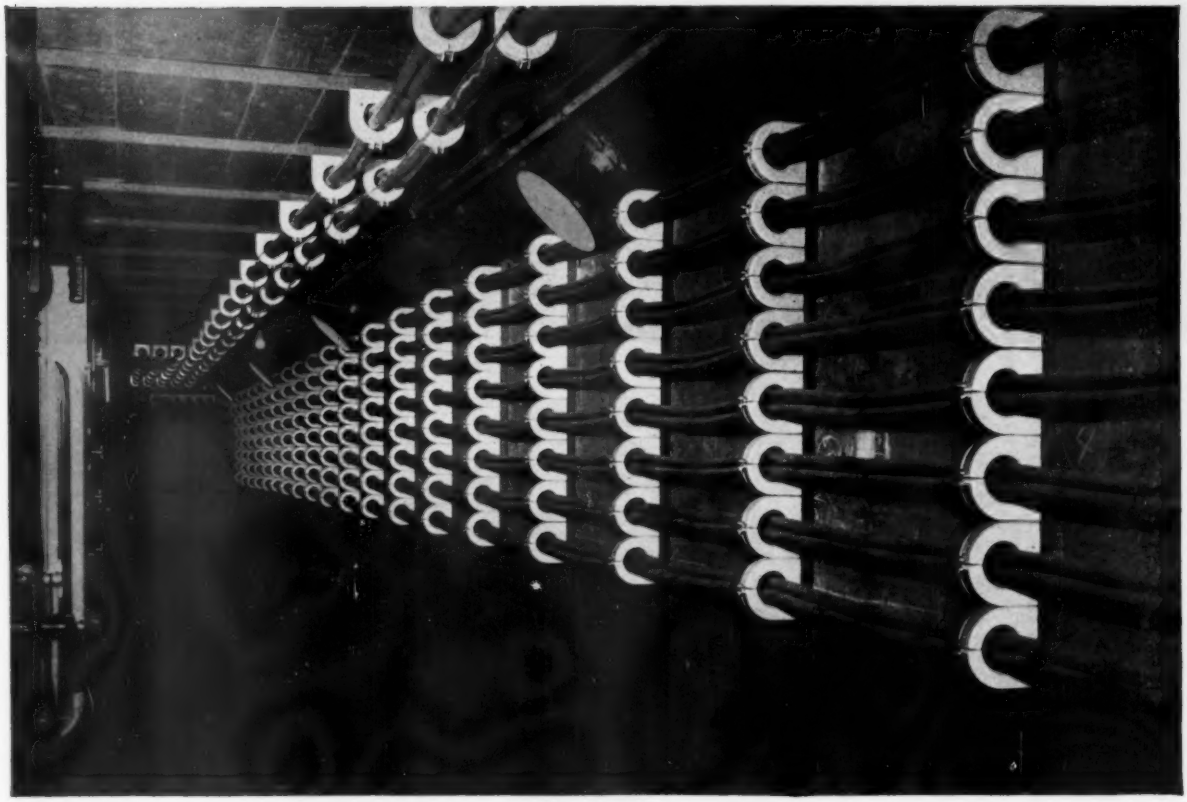
When you install G-E magnetic starters, you can speed installation, and reduce your costs for greater profits. Nine starter features save you money, yet your customers get the customer-proved dependability of G-E magnetic starters. Take advantage of these nine features for speedier installation on your next job.

Write Section 733-1, General Electric Company, Schenectady 5, N. Y., for bulletin:

GEA-6198 **Magnetic Starters**
GEA-6322 **New Size 4 Magnetic Starter**

For further information, contact your G-E Apparatus Sales Office or Distributor.

GENERAL ELECTRIC



for maximum dependability . . .

world's most modern shell plant specifies KEYSTONE 5KV CABLES

Nothing was spared to provide the surest and most adequate supply of electrical energy for the huge motors, pumps and other equipment that make the Scranton Ordnance Plant, operated by the United States Hoffman Machinery Corporation, the largest and most modern of its type in the world.

In production less than 18 months after the project was approved, the plant makes extensive use of Keystone-Hazaprene 5kv non-shielded cable.

A typical application of this top-quality, yet economical cable is found in the plant's forge shop. There, 1/conductor 750,000 mcm Keystone-Hazaprene 5kv non-shielded cables feed power from 3 - 5000 kva transformers to 12 - 600 hp and 12 - 450 hp pumps which provide hydraulic pressure for the main drawing and forging operations. These dependable power feeder cables are installed in interconnecting underfloor tunnels like the one shown above.

You, too, can use Keystone cables to advantage in your operation. Ask for Bulletin H-463 for full details or write Hazard Insulated Wire Works, Division of The Okonite Company, Passaic, N. J.

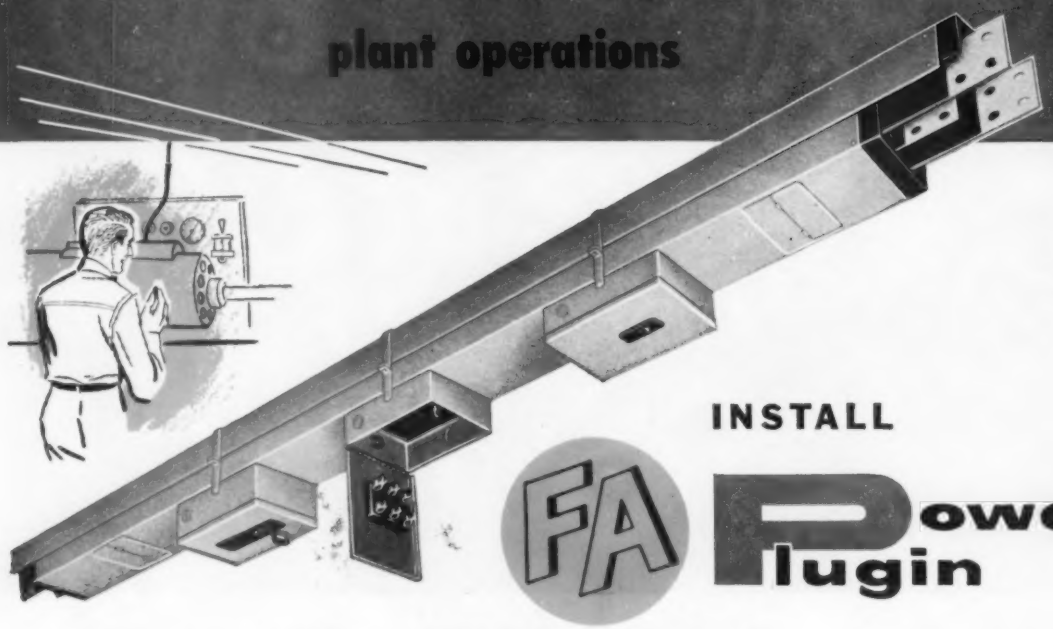
2954

HAZARD

insulated cables

PRODUCT OF OKONITE RESEARCH

Increase EFFICIENCY • ECONOMY FLEXIBILITY of plant operations



INSTALL

FA Power Plugin

YOU CAN ADD to the efficiency, economy and flexibility of new or modernized factory buildings and, at the same time, add to your prestige and profit by recommending installation of Ⓕ POWERPLUGIN to your industrial customers.

Ⓕ POWERPLUGIN is the modern system of power distribution — safe, dependable, economical and flexible. It facilitates plant production by making power available where and when it is needed, enables machines to be regrouped and relocated without disrupting production, reduces voltage drop to a minimum by eliminating long lead-ins, cuts maintenance costs and provides other savings. Too, it is 100% reusable.

Ⓕ POWERPLUGIN is approved by the Underwriter's Laboratories for label service. It is made in standard 10 foot sections with plug-in out-lets every foot of the way or alternately on two sides. Sections can be arranged to fit almost any need. They can be run horizontal or vertical at floor level or overhead.

Ⓕ POWERPLUGIN is available in the following capacities: 250 to 1000 amps (1200 and 1500 amps also available), 600 volts AC or less with Klampswitchfuz, Shutlbrak or Circuit Breaker plug-in units.

The next time you are called upon to install a system of power distribution recommend Ⓕ POWERPLUGIN. Your nearest Ⓕ representative, listed in Sweet's, will be glad to discuss details with you.

ⒻPOWERPLUGIN FEATURES

Ⓕ POWERPLUGIN is made of 16 gauge steel with attractive pearl gray enamel finish.

Insulators are one piece glazed porcelain with steel channel supports riveted into position.

Flush type hinged cover plug-in openings, simplified, adjustable two-screw type fasteners for plug-in units, two sliding type mounting brackets per section for hanging as desired, electro silver-plated contact surfaces or joints with two or four brass jam bolts with phosphor bronze cup washers in elongated fastening holes for fast assembly are other features.

Either copper or aluminum conductors available.

Frank Adam Electric Co.

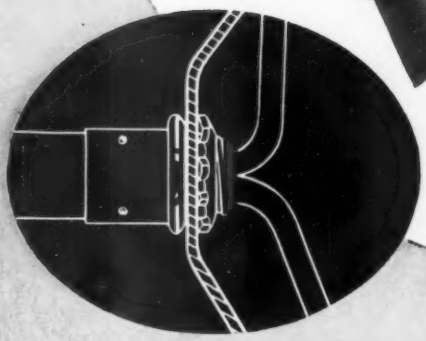
Phone JEfferson 3-6550
BOX 357, MAIN P. O. • ST. LOUIS 3, MO.

makers of:
busduct • panelboards • switchboards
service equipment • safety switches
load centers • Quikheter

Red Throat

B-M 21B, THE NEW INSULATED THROAT INDENTER CONNECTOR FOR E.M.T.

Four Ways Finer



1. Protruding rounded red plastic lip of bushing prevents cutting of insulation—eliminates shorts.
2. Full thread screws into all conduit fittings. Lip of RED THROAT bushing protects thread from damage.
3. Deep dished eight pronged lock nut is easier to drive on—screws flush to shoulder and digs into metal of box for vibration proof positive ground.
4. Permanent locked-in bushing insures smooth burr-free raceway for easy fishing. No extra work and costs no more.

Briegel, the Original Indenter Fittings are neater in appearance, easier and faster to use. Installation is simple and less expensive. Two quick squeezes sets them forever. Try B-M Indenter Fittings and get more profits from each job!

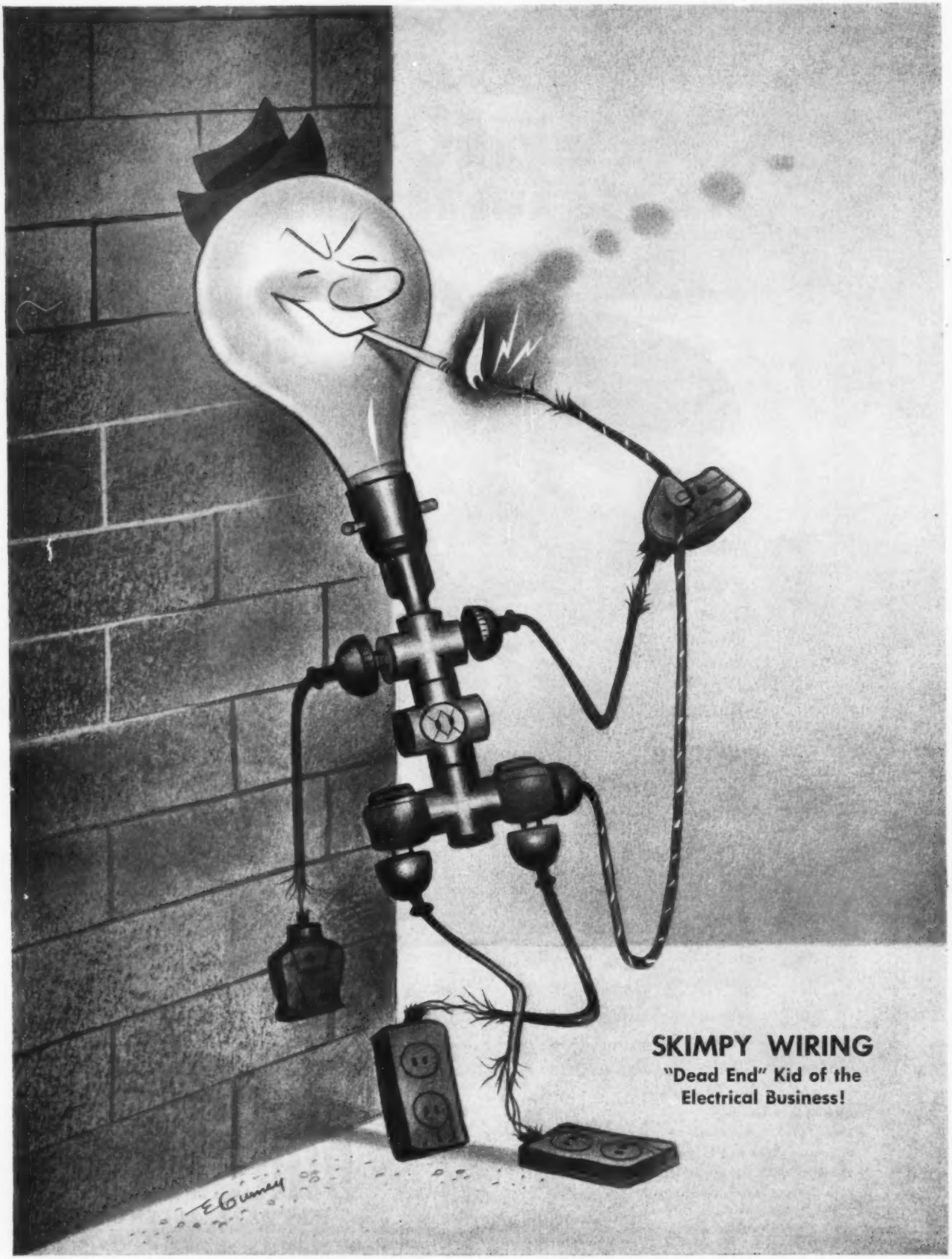
ALL BRIEGEL FITTINGS ARE U. L. APPROVED AS CONCRETE-TIGHT

Order from Your Wholesaler!

All B-M Indenter Fittings are U.L. Approved as concrete-tight and for general use (File Card E10863). Also comply With Federal Specifications W-F-406.

BRIEGEL METHOD TOOL CO.
GALVA • ILLINOIS

Warehouse Stocks in Principal Cities for Immediate Delivery!


SKIMPY WIRING
"Dead End" Kid of the
Electrical Business!

"DEAD END" KID OF THE ELECTRICAL BUSINESS!

But, a big profit-maker for you—that's SKIMPY WIRING!

You know this evil little fellow. He lives in 8 out of 10 homes in America. He's the problem child of most of the electrical business, today!

But not *your* business! Because wherever you find Skimpy Wiring in a home, he means a potential *re-wiring job for you!*

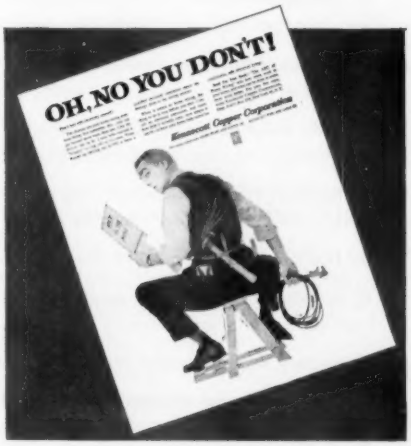
The only trouble is — most homeowners don't even know they've got Skimpy Wiring in their homes. They have to be told . . . they have to be shown how Skimpy Wiring cuts down the efficiency of their appliances, how he steals their money by wasting electricity, how he can actually set fire to their homes!

That is why Kennecott is running full-page ads like that shown below in the Saturday Evening Post and This Week magazines.

It's a campaign that adds the full power of national advertising to your own local efforts to increase your re-wiring business, to open up the way to bigger, better installations of new home wiring. Tie in with it!

FREE! TIE-IN MATERIAL!

Add punch to your own local drive for adequate home wiring! Send today for free reprints and poster-sized blowups of Kennecott's full-page Saturday Evening Post and This Week magazine ads. Get free copies of the educational booklet, "The ABC of Home Wiring." Ask for complimentary home wiring Wall Chart, mat service folder and list of *at-cost* prices for large-quantity orders of all material available. No cost or obligation! Just write Kennecott Copper Corporation, Dept. EC-85, 161 East 42nd St., New York 17, N. Y.



Kennecott Copper Corporation

Fabricating Subsidiaries: CHASE BRASS & COPPER CO. • KENNECOTT WIRE & CABLE CO.

G-E enclosed circuit breakers are made to standard industry sizes in ratings from 10 to 600 amps. Separate stocking of breakers and enclosures means rapid delivery, keeps your inventory at minimum.

G-E molded case circuit breakers are built to meet 16 quality tests, are U/L listed

Fast arc quenching, quick make-and-break action mean durable operation for G-E circuit breakers

1. Operation is cool, life is lengthened through de-ionizing arc quencher that quickly snuffs out arc.

2. Operator can't tease contacts open or closed. Quick-make and break action of silver alloy contacts helps prevent burning.

3. Safe, positive protection against short circuits and sustained overloads with both thermal and magnetic trip.

4. Reduces costly production delays. Positive indication of "on," "off" or "tripped" permits speedy restoration of service.

5. Trip free. Cannot be held closed during a short circuit.

6. Installation simple and quick because of solderless lugs and straight-in wiring.

7. Factory sealed against tampering in sturdy, molded case.

8. Electrically and mechanically tested 16 ways for durability, safety, reliability and for accurate tripping time.

9. Available with all standard accessories for flexible use throughout industry.

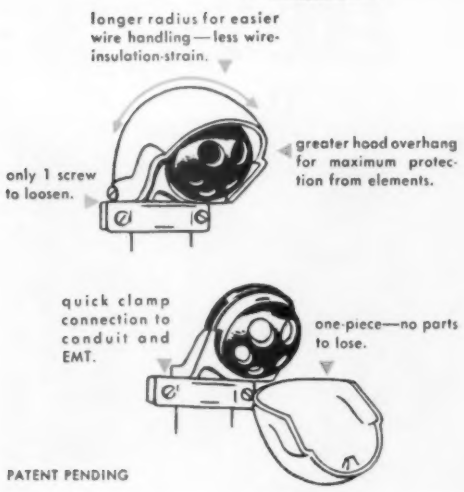
10. Prevents single phasing. Common trip opens all legs of circuit.

Enclosed circuit breakers can be locked on or off, are quickly installed. Enclosures for every purpose, including lead-plated water-and-dust-tight enclosure for corrosive atmospheres. Available from your G-E Trumbull Distributor. *Trumbull Components Dept., Section 8, General Electric Company, Plainville, Conn.*

GENERAL ELECTRIC

new "swing top" entrance cap

with the hood that hangs on a hinge!



PATENT PENDING

FOR EASIER, COST-SAVING INSTALLATION

Cut entrance installation time by *two-thirds* with Efcor's new "Swing Top" entrance cap. Loosen one screw, swing the hood open . . . that's all it takes to pull wires through the head! The patented, one-piece hinged construction retains the hood until you're ready to replace it. With conventional units, you're required to loosen several screws, completely remove the cover, put it in your pocket, or on the ladder where it might fall to the ground. "Swing Top" also has a longer radius to facilitate wire pulling and minimize strain on wire insulation. The rugged clamp connector permits quick attachment to conduit *directly against the wall.* No threading, no offsetting needed . . . accommodates EMT too.

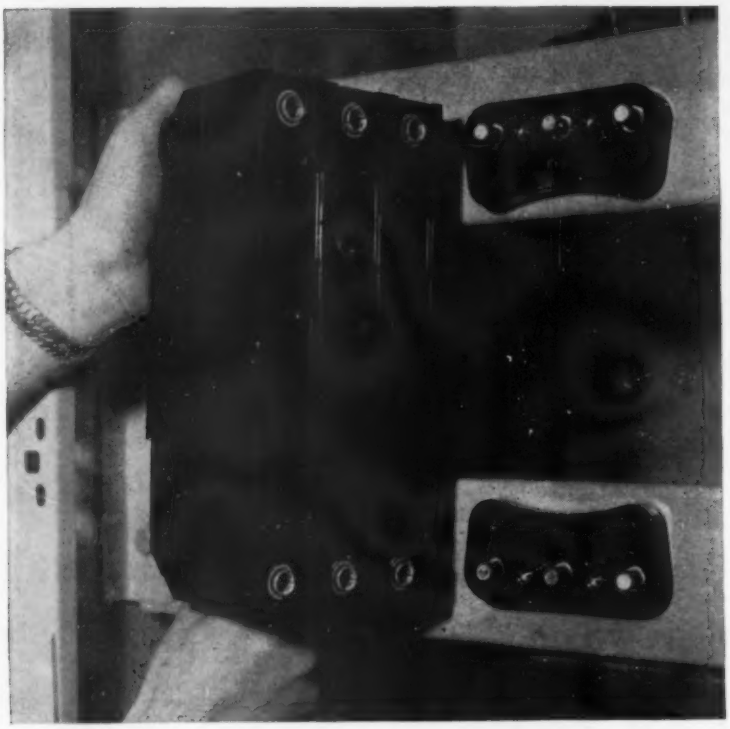
WRITE FOR FREE SAMPLE *or see your Electrical Distributor.*

Efcor Reg. Trade Mark

electrical fittings corporation

37-50 57th STREET • WOODSIDE 77, NEW YORK

Specify I-T-E Plug-In Mounting for Molded Case Circuit Breaker Switchboards



IT'S EASY TO MOUNT an I-T-E Molded Case Circuit Breaker when it is equipped with plug-in arrangement. Simply place the integral connectors over the stationary jacks and seat the breaker. It's safe too. All terminals are shielded to provide maximum protection to the worker.

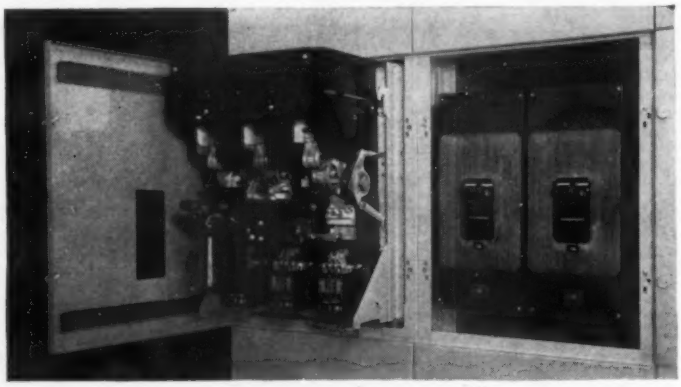
Why settle for less! I-T-E Molded Case Circuit Breakers designed for plug-in mounting in switchboard applications provide features and advantages you get only in this modern, streamlined construction. Plug-in mounting is a time-proved method employed for many years in maritime switchgear, and is approved by Underwriters Laboratories Inc.

Here are some of the advantages of I-T-E Plug-In Mounting: *Added Safety*. Breaker terminals are concealed. No live parts exposed. *Flexibility*. Breaker ratings can easily be changed within their respective frame sizes. *Ease of Installation*. Breakers simply *plug in*. Molded supporting block assures automatic alignment.

Investigate I-T-E Plug-In Mounting before specifying your next molded case breaker switchboard. I-T-E plug-in molded case circuit breakers are available in ratings from 15 to 600 amp, up to 600 v a-c, up to 250 v d-c.

For details, contact your I-T-E representative or leading independent switchboard manufacturers. Or write Small Air Circuit Breaker Division, I-T-E Circuit Breaker Company, 19th & Hamilton Sts., Philadelphia 30, Pa.

FLEXIBILITY. Withdraw one breaker, insert another of the same frame size with the desired continuous ampere rating. No wiring changes, no tools needed. All I-T-E Molded Case Circuit Breakers can be supplied with plug-in mounting arrangement.



COMBINE TWO TYPES OF BREAKER in the same switchboard. Large air circuit breaker pantograph mounted for horizontal drawout. Molded case circuit breakers plug in mounted for easy installation and replacement.

I-T-E CIRCUIT BREAKER COMPANY • **Small Air Circuit Breaker Division**

NEW 7½-acre plant (under one roof)
to provide
faster service for those who use...

WIRE BY PHELPS DODGE

Huge wire mill-warehouse offers immediate delivery service on wire and cable!

Phelps Dodge Copper Products Corporation's new plant at Yonkers, N. Y., covers seven and a half acres, is equipped with the latest facilities to service its customers.

A coordinated production and warehousing system in this plant enables Phelps Dodge to maintain stocks of every kind of building wire and cable ready for immediate filling of customer orders. Ten truck bays and a seven-car undercover freight siding will eliminate the usual loading delays, help speed shipments to their destinations. This new and exclusive system is an example of the careful attention Phelps Dodge has given to providing the finest service for its customers at this new plant.

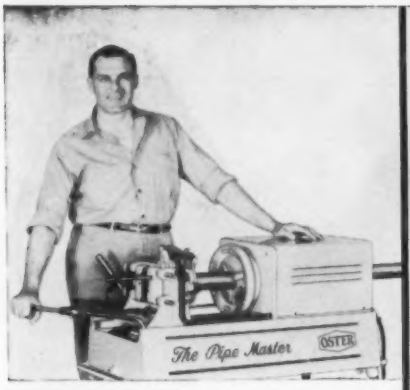
On every wiring job, large or small, where top quality materials, expert workmanship and experienced "know-how" are called for, *it pays to rely on Phelps Dodge and your Phelps Dodge* distributor!

PHELPS DODGE COPPER PRODUCTS CORPORATION

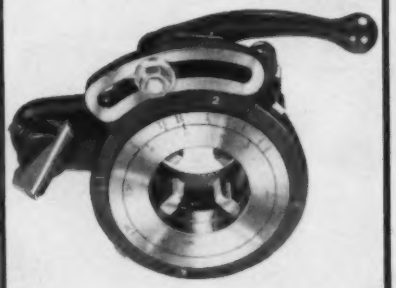
SALES OFFICES: Atlanta, Birmingham, Ala., Boston, Buffalo, Charlotte, Chicago, Cincinnati, Cleveland, Dallas, Detroit, Fort Wayne, Greensboro, N. C., Houston, Jacksonville, Kansas City, Mo., Los Angeles, Milwaukee, Minneapolis, New Orleans, New York, Philadelphia, Pittsburgh, Portland, Ore., Richmond, Roanoke, Rochester, N. Y., San Francisco, St. Louis, Seattle, Washington, D. C.

NEW POWER . . . NEW FEATURES . . .

It's the all-new OSTER No. 552 Pipe Master

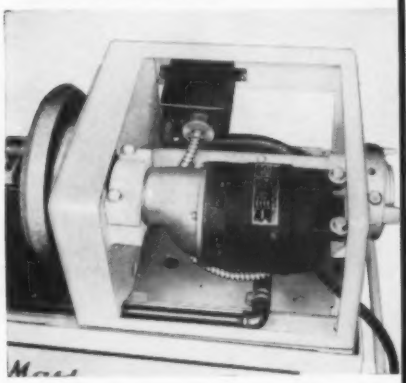


1 "You can take my word for it. This new model of the famous Oster 'Pipe Master' has everything you could ask for in a portable conduit threading machine. Just look at some of these features...



2 "This die head, for example. It's a quick-opening, adjustable, floating type, with top opening for thread inspection and bottom opening for chip disposal.

3 "And this *exclusive* patented 'Auto Grip' Chuck eliminates the need for bar or chuck wrench. The chuck automatically grips the pipe just as tightly as I want it.



4 "Here's the reason why this new machine threads faster . . . it's a new, more powerful motor. Universal, geared-head type —reversible, variable speed.

5 "It's lighter, too. And for moving it around, just take a look at this special stand, with those big rubber-tired wheels, available as optional equipment."

...the most POWERFUL 2" portable pipe machine on the market!

The all-new No. 552 Oster "Pipe Master" now offers you more for your threading dollar than ever before! Improved design . . . lighter weight . . . and new powerful motor give you even greater value than the famous No. 502 "Pipe Master" which preceded it.

Write *today* for free booklet giving complete information and specifications on the new Model No. 552 "Pipe Master". And make it a point to see a demonstration of this complete portable pipe machine at your Distributor's.

THE

OSTER

MANUFACTURING CO.

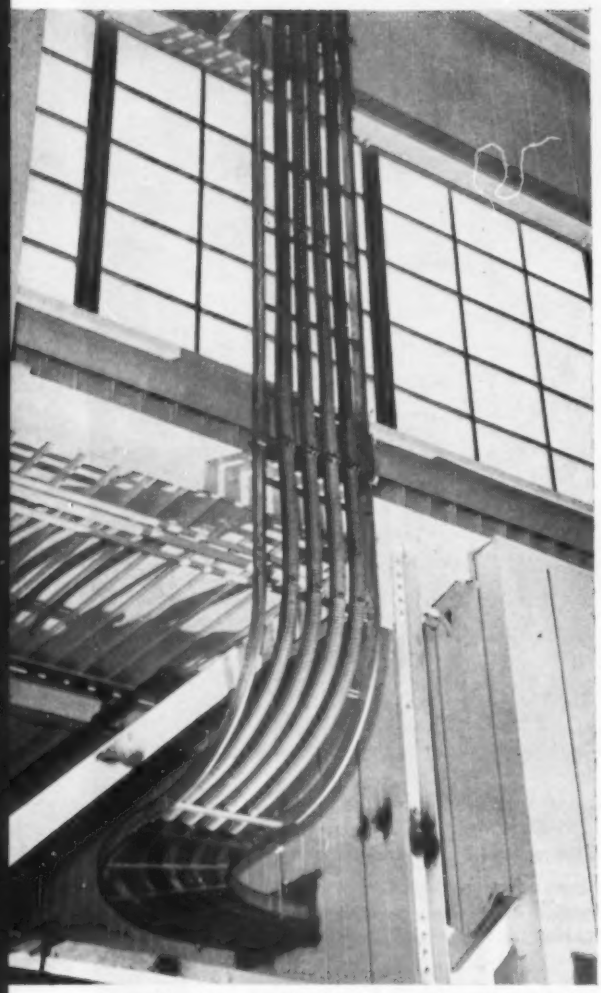
Main Office and Factory:

2046 East 61st St., Cleveland 3, Ohio

New York Factory Branch Sales and Service, 25-36 Jackson Ave., Long Island City 1, N.Y.

BUILDERS OF LOW COST THREADING EQUIPMENT SINCE 1893

7 ways new developments in wires wiring "modernization" business



Assembly plant reaped high-cost savings by installing flexible, quickly placed Anaconda **Interlocked-Armor Cable** from unit substation.

Plant wiring can be adequate and still be costly – because it is obsolete. This is a second phase of "adequate wiring" that is becoming of more and more concern to profit-squeezed management—and a new source of business for contractors—every day.

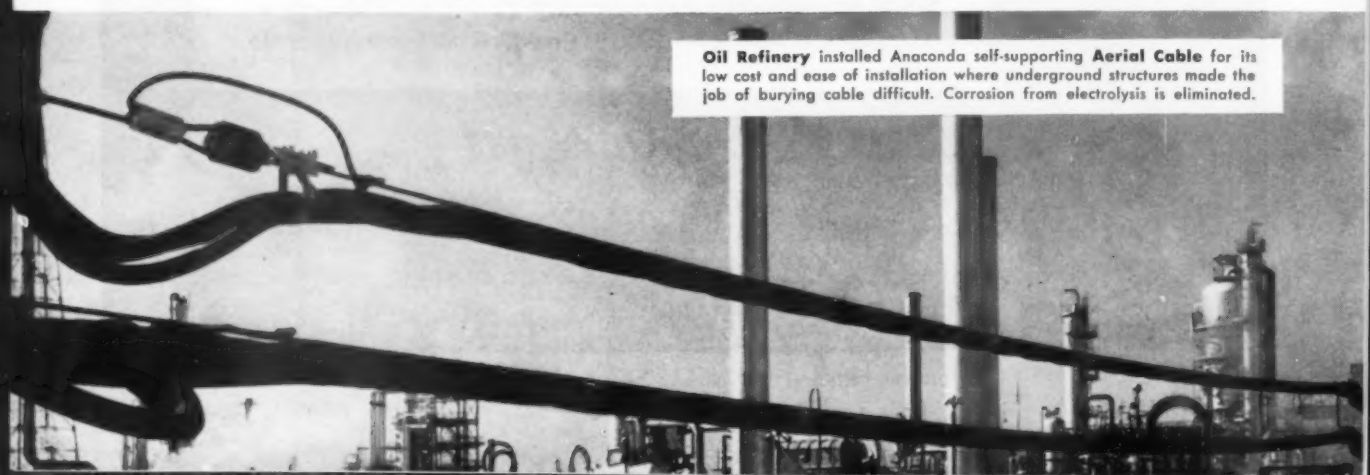
Since most plants were built—including some only a few years old—vast advancements in wires and power cables have taken place.

Let's take a look at 7 of the most important of these in light of changes that have taken place in the plants themselves, in most cases, since the original wiring was installed.

1. **NEW HIGHER VOLTAGES.** The trend to higher plant voltages—with its resulting savings in cable costs and line losses—poses a new problem: ozone, a by-product of high voltage, destroys ordinary insulation . . . and causes premature cable failure. Anaconda engineers have solved this problem with pioneering work in new *butyl* rubber. Anaconda AB butyl-insulated high-voltage cables have *inherent* resistance to ozone.

2. **NEW CABLE HAZARDS.** Chemicals, moisture, oil—natural to most modern plants—are tough on cable. Engineers at Anaconda have come up with an answer: Durasheath* rubber-insulated, neoprene-jacketed cable for all voltages. This rugged cable resists almost *every* enemy of cable life. Suggest its use everywhere—aerially, in ducts, or buried directly in the ground. It reduces down-time, maintenance and replacement costs.

3. **NEW OPERATING CONDITIONS** put a new demand upon wiring. Higher loads generate higher heat in cable . . .



Oil Refinery installed Anaconda self-supporting **Aerial Cable** for its low cost and ease of installation where underground structures made the job of burying cable difficult. Corrosion from electrolysis is eliminated.

and cables build for contractors

and more heat in cable installed underground or in other moist locations is tough on cable insulation. Today, AHW rubber insulation, used on many Anaconda rubber power cables, does the best job ever in withstanding *heat and moisture together.*

4. NEW EQUIPMENT. The addition of process-heating equipment, process or comfort air conditioning, or new production machines calls for more wiring to carry the load. Anaconda Interlocked-Armor Cable can be installed quicker than many other types of cable because it needs no conduit. Plant saves time and money when the cable is installed—and later, too, if cable must be moved.

5. MODERN BUSWAY SYSTEMS. Today you can *increase* the flexibility of busways—with Anaconda's flexible Powerduct* Cable. It just plugs into the busduct . . . and unplugs when management wants to move machines. There's no costly conduit to put up or rip out. And the cable is 100% salvageable on every move!

6. NEW POWER. When additional power is needed, Anaconda Aerial Cable is today's popular choice for the job, especially where the ground is packed with pipes and other structures or contains corrosive agents. It is fast, easy to install even between closely spaced buildings where clearance is limited. It's neat, safe, lower in cost than underground systems, and gives highest *reliability.*

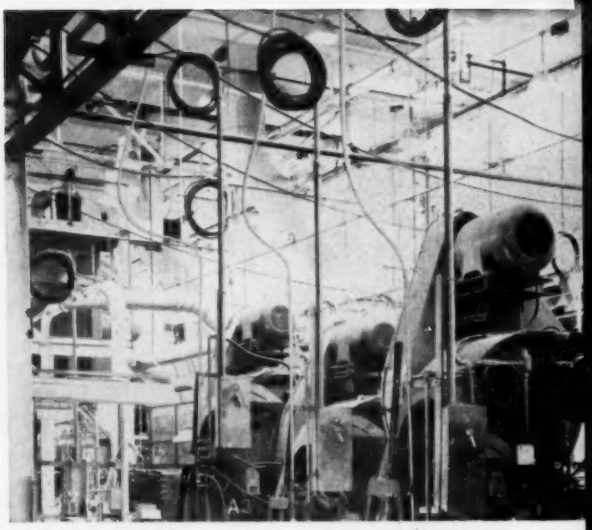
7. NEW ELECTRIC EQUIPMENT. The trend to automation and more complex machines puts new emphasis on control cable. The job cannot be left up to cable whose performance is just "so-so." Anaconda's years of cable experience have paid off in a new full line of control cables—with modern types of insulations and coverings to give them highest reliability.

This advertisement provides only a few examples of how modern Anaconda wires and cables can help you help industry in your area wire up for more economical, more efficient production. For more information, see the Man from Anaconda. Anaconda Wire & Cable Co., 25 Broadway, New York 4, N. Y.

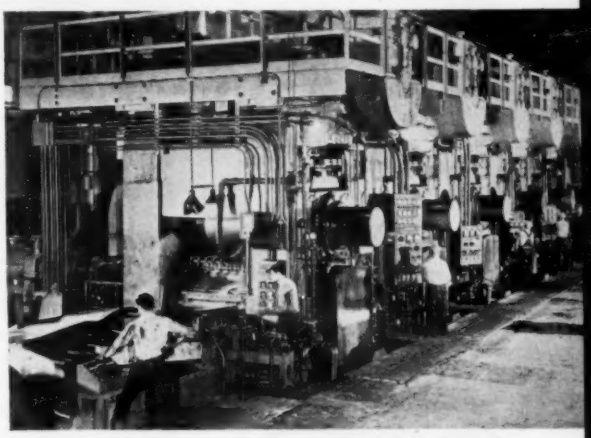
55280

*Reg. U. S. Pat. Off.

ANACONDA®

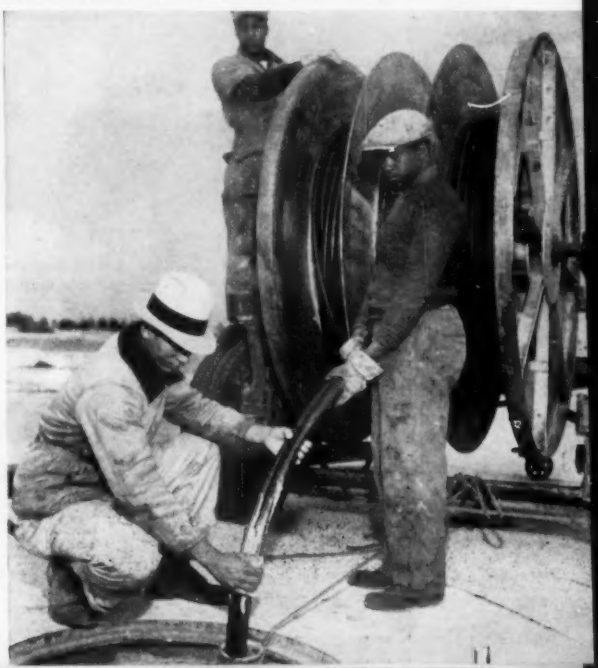


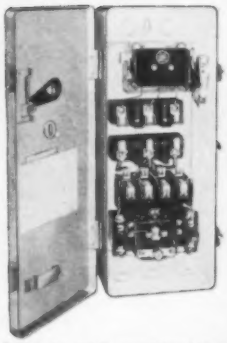
Metalworking plant eliminates expensive rewiring when equipment must be moved—by using flexible Anaconda **Powerduct Cable** from busduct to machine.



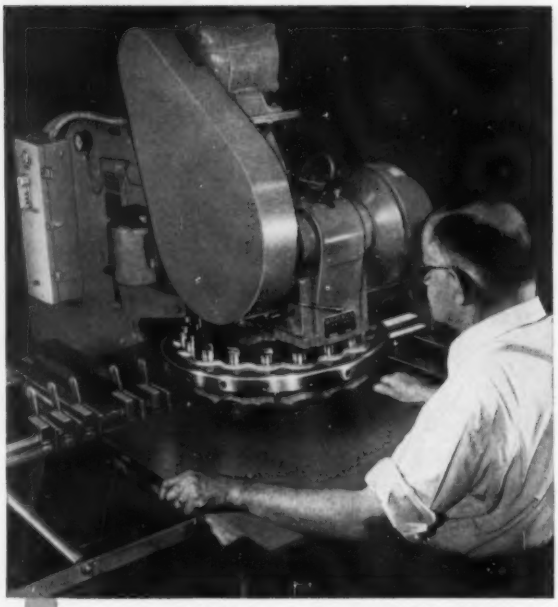
Steel Mill uses thousands of feet of Anaconda **Control Cable.** Modern insulations and jackets give most reliable service everywhere there's heat and moisture.

Chemical plant installed thousands of feet of Anaconda **Durasheath Cable** for power and lighting. Rugged neoprene jacket resists heat, moisture, acids and alkalies.

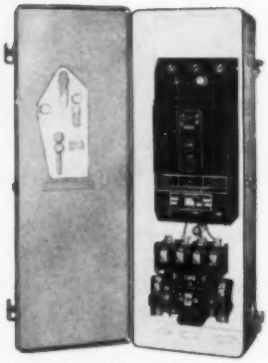




Bulletin 712 combination starter with manual, fused disconnect and solenoid starter in NEMA Type 1 general purpose enclosure



Weidemann turret punch press equipped with Allen-Bradley Bulletin 712 combination starter



Bulletin 713 combination starter with I-T-E circuit breaker and solenoid starter in NEMA Type 1 general purpose enclosure

BULLETIN 712-713 COMBINATION STARTERS

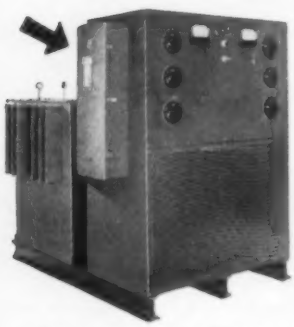
MAKE MORE COMPACT and SAFER CONTROL INSTALLATIONS

Many motorized machine installations call for a manual disconnect or circuit breaker ahead of the magnetic starter. In such cases, do not order the two units in separate enclosures . . . specify Allen-Bradley combination starters, which have both units in ONE enclosure.

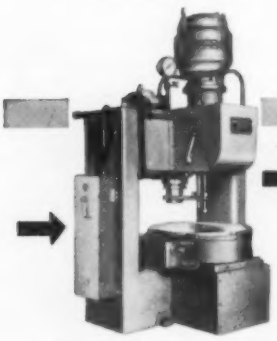
The cost—taking installation time into consideration—is usually less. The combination starter is "safe" for the operator. Cabinet cannot be opened unless disconnect lever is in OFF position. Starter and fuses are then "dead."

The magnetic starters in these combination starters are Allen-Bradley Bulletin 709 solenoid starters with double break, silver alloy contacts that need no maintenance. Thermal relays give continuously reliable overload protection.

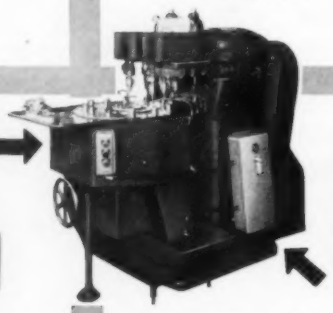
Send for Bulletin 712-713.



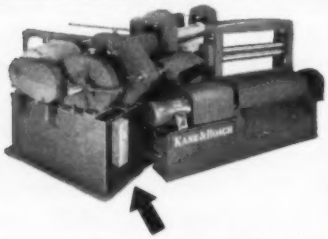
A-B comb. starter on CELAB 50 kw. selenium rectifier



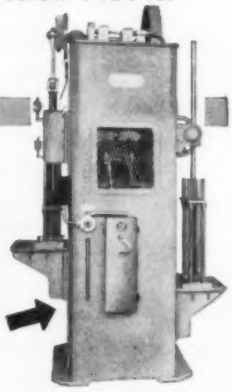
A-B combination starter on Loomis 100 ton hydraulic press



A-B comb. starter on Globe multiple tapping machine



A-B comb. starter on Kane & Roach slitting machine



A-B combination starter on Link spring fatigue tester

Allen-Bradley Co.
1307 S. First St.
Milwaukee 4, Wisconsin

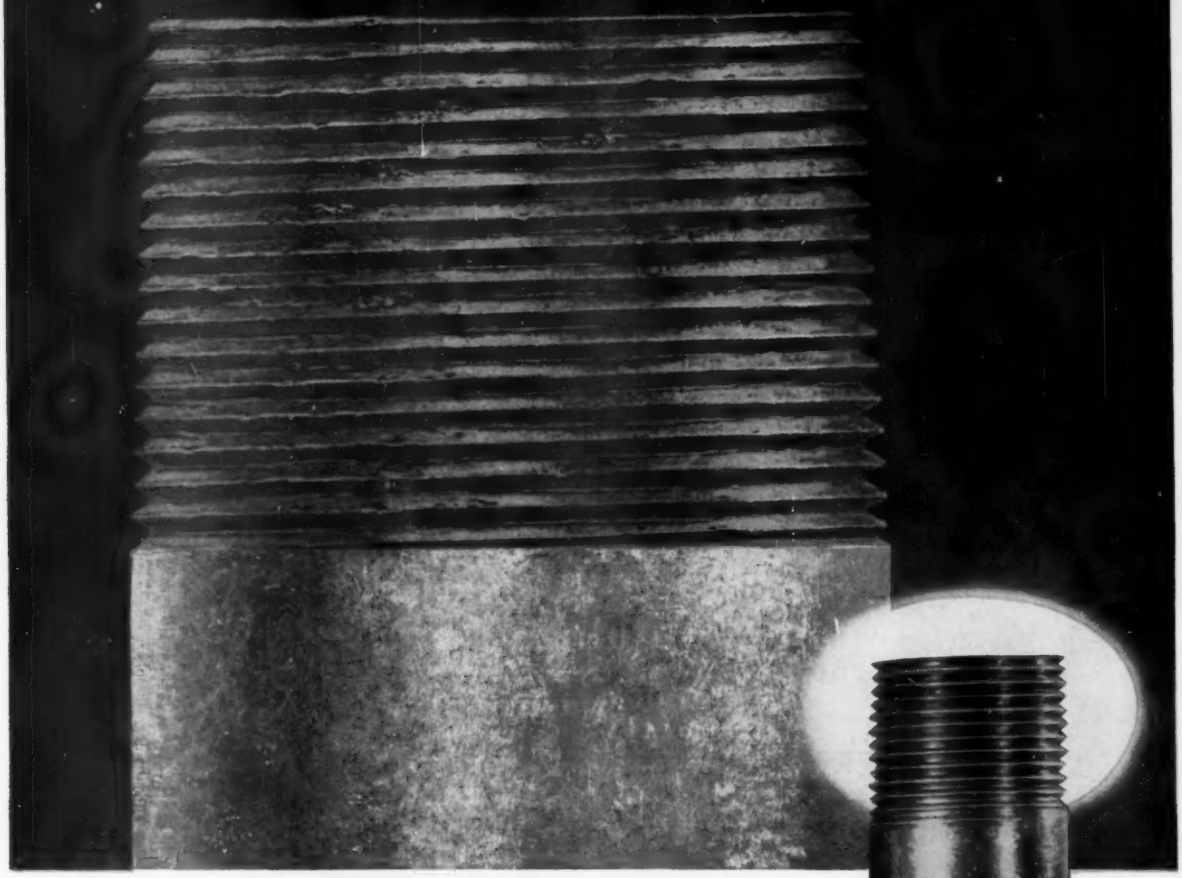
In Canada—
Allen-Bradley Canada Ltd.
Galt, Ont.

ALLEN-BRADLEY

SOLENOID MOTOR CONTROL

QUALITY

why pay for rusty conduit threads?



BUY PITTSBURGH STANDARD—THE ONLY HOT-DIP CONDUIT WITH GALVANIZED THREADS

There's little point to paying for the "privilege" of chasing threads when you can get rust-free threads on hot-dip galvanized conduit from Pittsburgh Standard *at no extra cost*. Only because we have opened the world's most modern conduit mill at Morrisville, Pennsylvania can we give you this new "standard of the trade" in production quantities . . . and we are the only manufacturer who can. Call your nearest Pittsburgh Standard wholesaler today, or write us for his address . . . Pittsburgh Standard Conduit Co., 61 Bridge St., Pittsburgh 23, Pa.

PLANTS AT MORRISVILLE & ETNA, PA.

RIGID STEEL CONDUIT • ELECTRICAL METALLIC TUBING • ELBOWS • COUPLINGS • FITTINGS

Lady of Lourdes Hospital, Camden, New Jersey

IN HOSPITALS, TOO, IT'S *"Talk-Don't Walk"*

MODERN ARCHITECTURE— MODERN INTER-COM SYSTEMS

Modern buildings of all types are wired for inter-com sound systems. Efficiency demands "Talk—Don't Walk."

The beautiful new Lady of Lourdes Hospital at Camden, New Jersey, has taken advantage of the permanence and trouble-free performance of Belden Inter-Com Cables for its built-in systems. Specifically, Belden No. 8743 is used for its under-pillow radio receivers.

There is a specialized Belden Cable for every inter-com or sound system requirement.

Belden Manufacturing Co., 4623-A W. Van Buren St., Chicago 44, Ill.

"Talk-Don't Walk"

For *Permanent* Installations
For Profitable Work

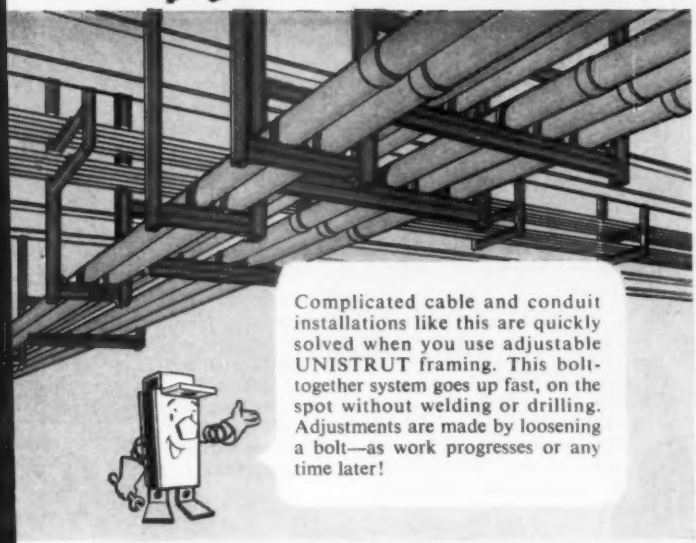
FOR EVERY TYPE OF INSTALLATION
FOR EVERY TYPE OF EQUIPMENT
BELDEN HAS THE CABLE BUILT TO MANUFACTURERS' SPECIFICATIONS

Belden *Inter-com* **CABLE**

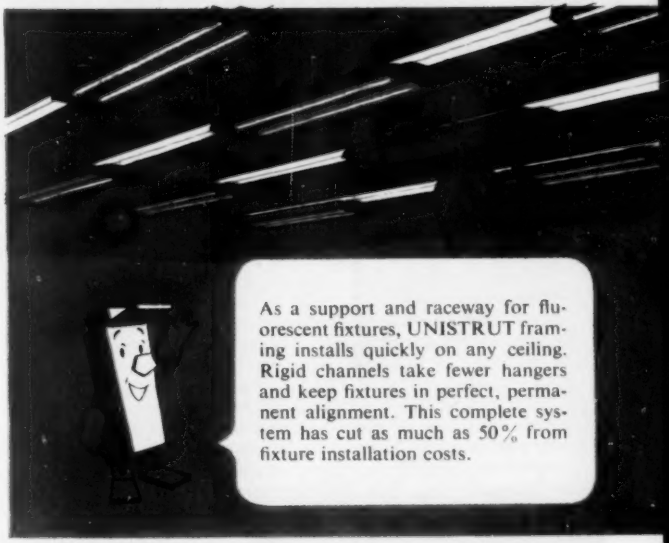
"The Sky's The Limit"

—when you build with UNISTRUT®

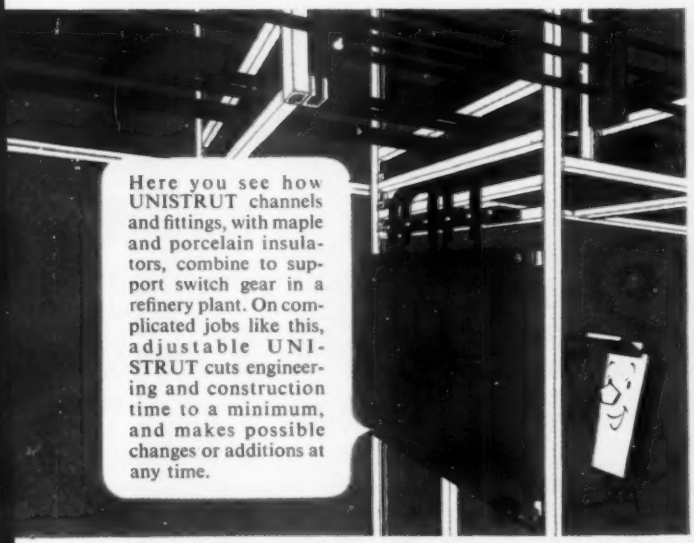
Mr. Strut shows how flexible UNISTRUT® framing saves time and dollars on electrical supports



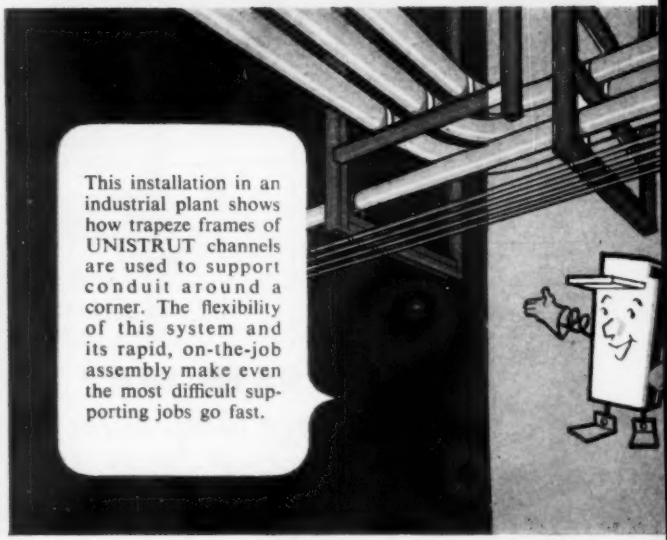
Complicated cable and conduit installations like this are quickly solved when you use adjustable UNISTRUT framing. This bolt-together system goes up fast, on the spot without welding or drilling. Adjustments are made by loosening a bolt—as work progresses or any time later!



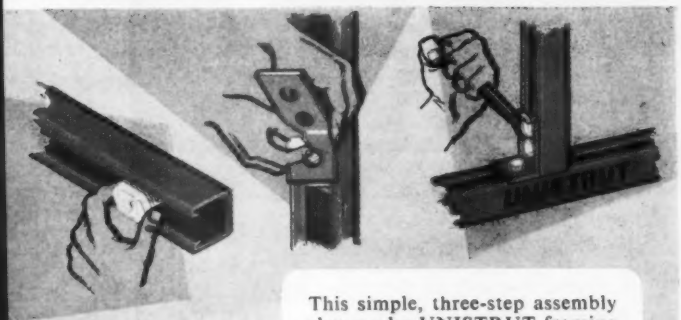
As a support and raceway for fluorescent fixtures, UNISTRUT framing installs quickly on any ceiling. Rigid channels take fewer hangers and keep fixtures in perfect, permanent alignment. This complete system has cut as much as 50% from fixture installation costs.



Here you see how UNISTRUT channels and fittings, with maple and porcelain insulators, combine to support switch gear in a refinery plant. On complicated jobs like this, adjustable UNISTRUT cuts engineering and construction time to a minimum, and makes possible changes or additions at any time.



This installation in an industrial plant shows how trapeze frames of UNISTRUT channels are used to support conduit around a corner. The flexibility of this system and its rapid, on-the-job assembly make even the most difficult supporting jobs go fast.



This simple, three-step assembly shows why UNISTRUT framing saves you time and money on electrical framing. The special spring-held nut holds strong as a weld, yet no welding or drilling is ever required. Only a hacksaw and wrench are needed to build frames for almost everything.

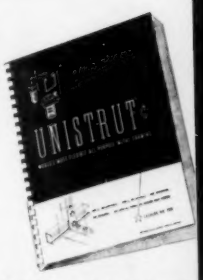
Free Catalog!

Send today for your free copy of the 78-page catalog No. 700. Shows countless examples of how to rack, frame, suspend and support all kinds of mechanical and electrical equipment.

U. S. Patent Numbers

2327587	2541908	2329815	2345650
2363382	2696139	2380379	2405631

Other patents pending



UNISTRUT PRODUCTS COMPANY
1013 W. Washington Blvd.
Chicago 7, Illinois **Dept. E-8**

Please send without obligation items checked below:

☐ Catalog No. 700 ☐ UNISTRUT sample

Name.....

Company.....

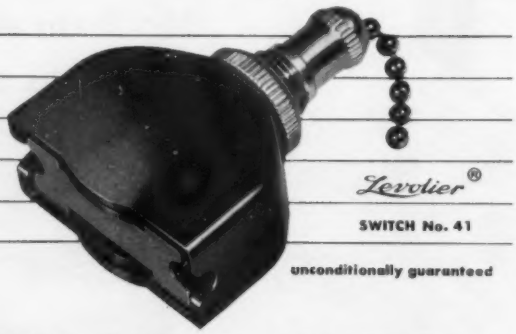
Address.....

new design

Rugged Too! Defies Replacement

What you don't see in this modernly-styled Levolier® industrial lampholder is as important as its attractive lines. Built to eliminate replacement, the lampholder cap and casing is double thick impact-resisting molded phenolic. The screw shell inside is .006" heavier than standard. The housing, which screws together at the lever, encloses the proven Levolier® switch mechanism with either push button action or universal lever control. Models include ⅛", ⅜", ¼" and pendant caps.

install it — forget it



IT'LL LAST A LIFETIME

You have no replacement worries when you use the No. 41 Levolier® switch. It has no match for quality and is so trouble-free and durable it is unconditionally guaranteed against failure. Ideal in any canopy mounting for individual control of fluorescent or incandescent lighting — also FHP motors. Its rugged, one-piece molded phenolic case gives better insulation and makes wiring easier. 6 amp, "T" rated, 125 volts. Underwriters' Laboratories approved.

only McGILL makes Levolier® Switches

THE SAFE WAY

to change lamp bulbs is with McGILL® adaptable lamp changers

You keep your feet on the ground even when you're changing lamp bulbs up to 30 feet above the floor with the McGill Adaptable Lamp Changer. Lightweight steel pole is furnished in 5' insulated sections that lock together securely by spring-actuated buttons. Several style heads available for virtually any size, shape and type of bulb.

McGILL® grounded guards with the PREFERRED NEW GROUNDING ARRANGEMENT

★ Conform to N. E. C.
★ Grounding adopted as standard by American Standard Ass'n.
★ Underwriters' Laboratories Inspected

McGill grounded portable lamp guards give you the advantages of the preferred, new grounding arrangement—a 3-blade plug and convenience outlet with 2 parallel blades and a U-shaped third blade for ground. These portables will outlast several "inexpensive" portables because all component parts are quality built — molded phenolic handles — heavy steel wire cages, electrically welded and zinc plated with bright chromate finish. Levolier switch and keyless types, with or without 16-3 SJ black rubber cord.

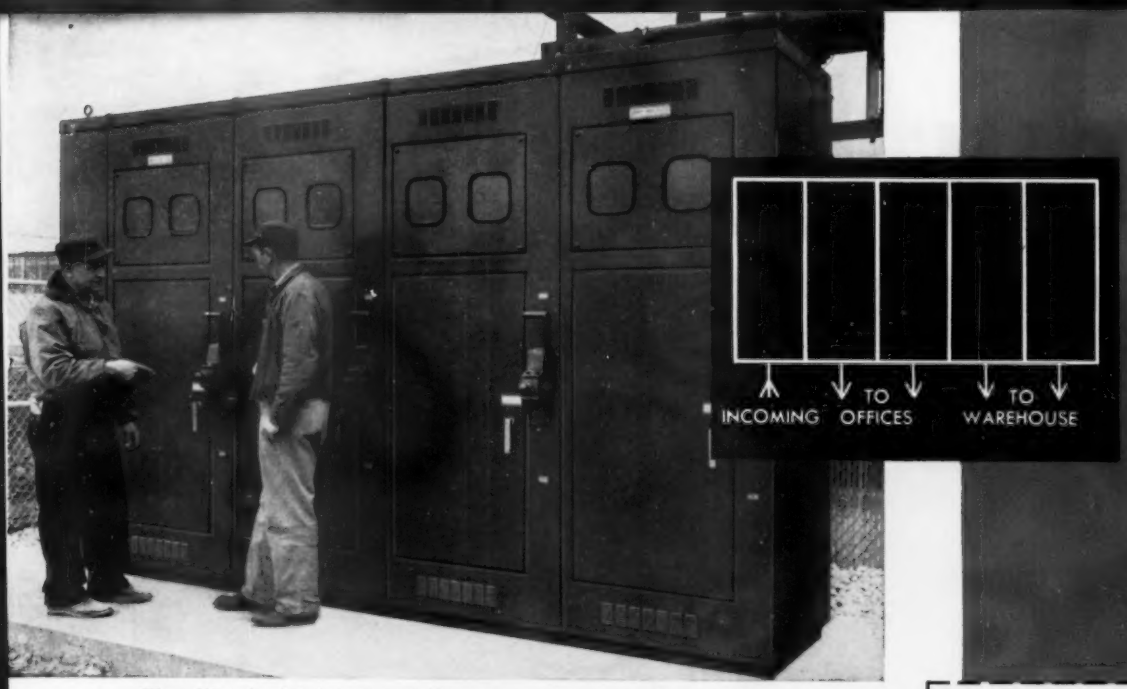
50th McGILL Anniversary

YOU CAN DEPEND ON

McGILL QUALITY

Available through leading Electrical Wholesalers
For complete information on products of the McGill Electrical Division, write today for Catalog No. 49-A.

McGILL MANUFACTURING COMPANY, INC.
450 N. Campbell St., Valparaiso, Indiana



Wm. Wetzig (right), Jewel Tea Co. engineer, confers with John Corsiglia of Hyre Electric Co. installation contractor.

CUT THE COST OF YOUR HIGH-VOLTAGE SUPPLY SYSTEM BY SPECIFYING S&C METALCLAD SWITCHGEAR . . . IT DOES THE JOB FOR HALF THE MONEY

Get off to a good start on the plans for your electrical system by selecting S&C Metalclad Switchgear. That is what A. Epstein & Sons did for Jewel Tea Company's new office-warehouse building. The savings made at the switching center were considerable, and they were reflected in a lower cost high-voltage supply system.

S&C Metalclad Switchgear provides all the necessary protection and switching for high-voltage feeders—at about half the cost of other types of metalclad switchgear. A simplicity of design assures complete dependability with far less maintenance.

Electrical engineers and contractors alike find the experienced recommendations of S&C field engineers extremely valuable in reducing electrical construction costs. Write or phone your nearest S&C field office . . . they will be glad to assist you.

MR. SOL KRIVO

Chief Electrical Engineer for A. Epstein & Sons—Chicago architect-engineers—planned the high-voltage supply system for the newest Jewel Tea Company building. He says, "Since S&C were the originators of this type of outdoor metalclad switchgear, we are sure they have the 'know-how' to furnish equipment best fitted to our jobs. Our customers have been completely satisfied by the simplicity, low cost, and easy maintenance of S&C Metalclad Switchgear."

S&C

Specialists in High-Voltage Switchgear for Electric Utilities since 1910

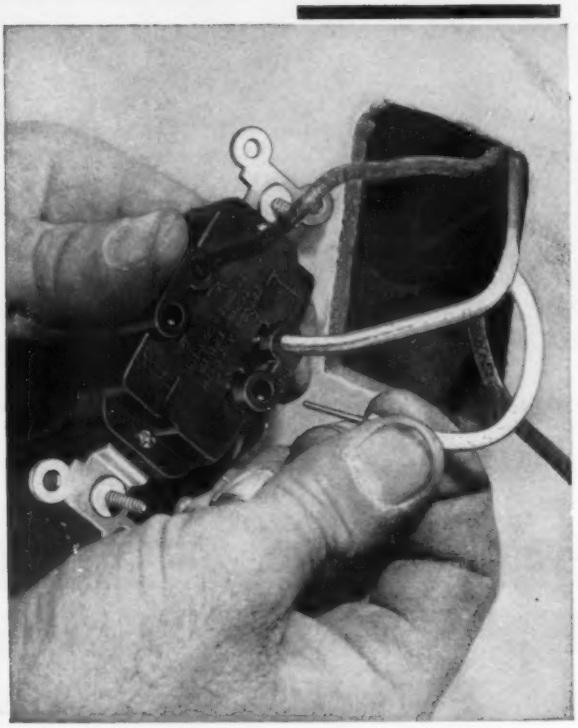
S&C ELECTRIC COMPANY

4433 RAVENSWOOD AVENUE • CHICAGO 40, ILLINOIS, U. S. A.

In Canada: S & C ELECTRIC CANADA, LTD.
8 Vansco Road
Toronto 14, Ontario

Consult your telephone directory. Sales offices in Birmingham, Boston, Buffalo, Chicago, St. Louis, Cleveland, Dallas, Dearborn, Denver, Houston, Huntington, Indianapolis, Jersey City, Kansas City, Little Rock, Memphis, Minneapolis, New Orleans, Philadelphia, Pittsburgh, Portland (Ore.), St. Petersburg, Salt Lake City, San Francisco, San Gabriel (Los Angeles), Seattle, Syracuse, Washington, D. C.

Know What's New



New SILENT Mercury Switch

with lighted handle as added feature . . . has extra long life

Single Pole

Three-Way

Turns lights ON and OFF without making any sound at all. When light is OFF, a tiny neon lamp inside the handle goes on . . . makes this G-E Silent Mercury Switch easy to locate at night. Will give years of service under normal usage. Cost of operation varies with electrical rates but, on an average, is less than 1c a year.

As in all G-E Mercury Switches, a quiet pool of mercury makes or breaks the circuit. There is no mechanical action to wear out. Fewer parts to wear mean longer switch life. Life tests on these switches have run a million cycles without failure.

Ideal for installation at home entrances, in hallways, bedrooms, bathrooms, hospital rooms, hotel rooms, and motels . . . all locations where a soft light will help to spot the switch in the dark.

PRESSURE-LOCK Terminals

G-E offers a complete line of wiring devices with this feature

30 Switches

15 Outlets

3 Ceiling Lampholders

In outlets, switches, and lampholders, General Electric offers the most complete line of devices with pressure-lock terminals. This is the new wiring method, developed by G.E., that eliminates binding screws, provides a 20% better contact, simplifies device installation, and makes a pressure connection for long, dependable service. Pressure-lock terminals have proved so valuable that General Electric has extended this new feature to a wide range of devices.

Pressure-lock terminals make wiring easy, whether you use No. 10, No. 12, or No. 14 Awg. wire. Just strip off the insulation, push wire into the terminal openings, and the G-E pressure-lock terminal grips the wire for a firm, dependable connection. Wires can be removed easily from terminals simply by inserting a screwdriver into release slots.

-You'll Profit More

Double Outlet

Single Pole Switch

Keyless Lampholder

Pull Chain Lampholder

Lampholder W/Outlet

New SURFACE WIRING Devices

with Pressure-Lock terminals cut costs

The G-E line of Surface-Mounted Devices with Pressure-Lock Terminals is designed for low-cost wiring ease. Devices are totally enclosed . . . no exposed current-carrying parts, and no parts to disassemble. Pressure-Lock terminals give firm, positive electrical and mechanical connection.

To wire, simply strip non-metallic cable to gage on back of each device. Insert screw driver in slot at desired end of device and remove plastic pryout. Insert stripped cable in opening, push cable until locked in place by pressure-lock terminals . . . pull cables to make sure of firm seating. Staple each cable within 6 inches of device, fasten device to surface with wood screws provided.

These are just a few of the new products developed by General Electric to help the electrical contractor do a better wiring job, more easily.

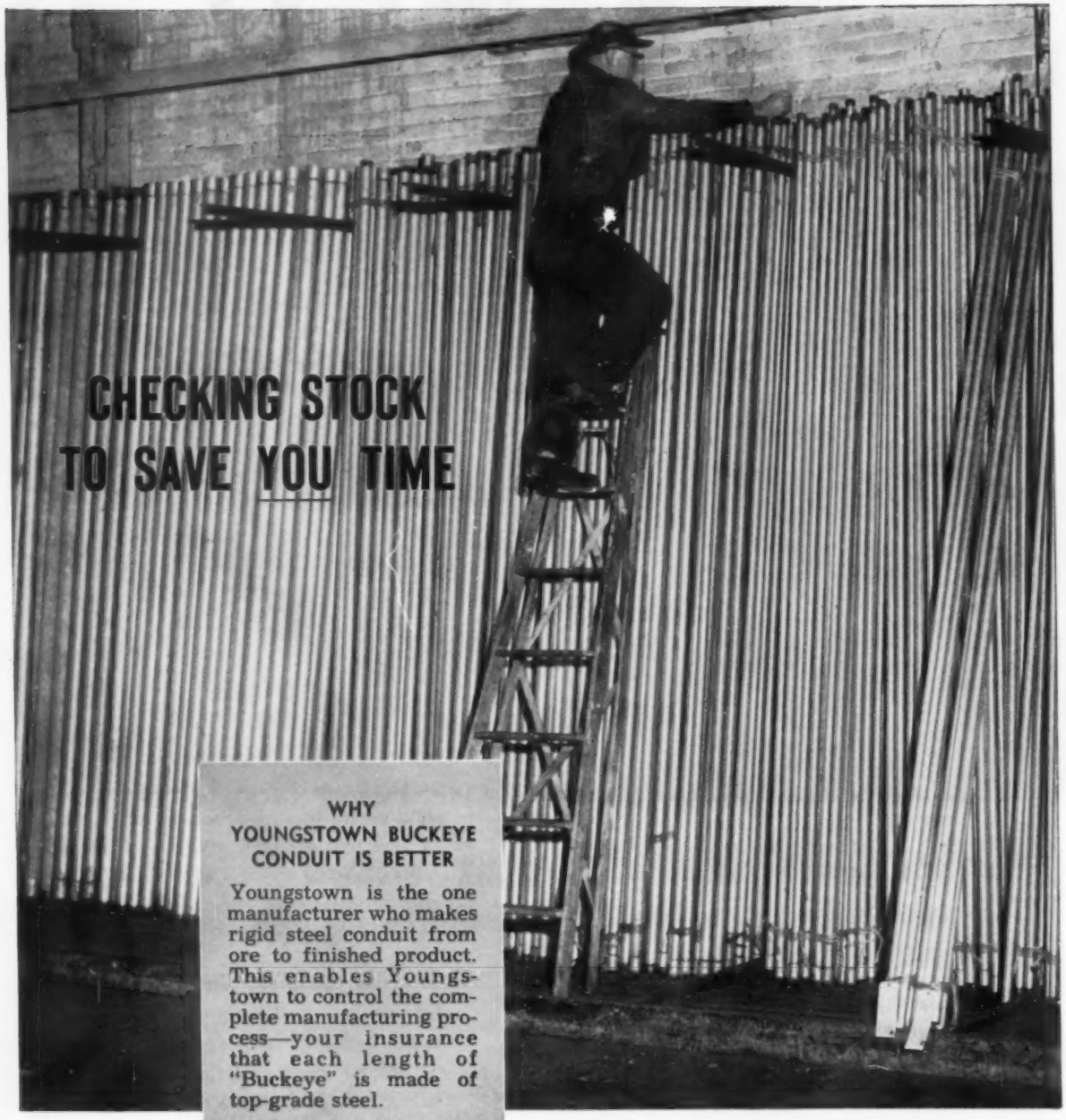
Ask your G-E distributor to show you some of the many new features that have been added to General Electric Wiring Devices. Here are features that consumers as well as contractors appreciate. Product improvements that build demand for the quality lines — like the new Lighted Handle on the popular Silent Mercury Switch, and Pressure-Lock terminals on complete lines of G-E devices, including the new Surface Wiring line.

You can depend on General Electric — for the newest developments in wiring devices, for quality products, and a breadth of line that includes everything needed to handle wiring jobs — commercial or industrial, residential or rural. In short, you can depend on G.E. for *more profit*—every time!

See the complete line of G-E Wiring Devices at your distributor's. It's constantly expanding, and every new product or product improvement is designed to make your wiring job easier, to increase your profit on every job, and add to your prestige as an electrical contractor. Wiring Device Dept., General Electric Co., Providence 7, R. I.

Progress Is Our Most Important Product

GENERAL ELECTRIC



WHY YOUNGSTOWN BUCKEYE CONDUIT IS BETTER

Youngstown is the one manufacturer who makes rigid steel conduit from ore to finished product. This enables Youngstown to control the complete manufacturing process—your insurance that each length of "Buckeye" is made of top-grade steel.

Youngstown

BUCKEYE CONDUIT

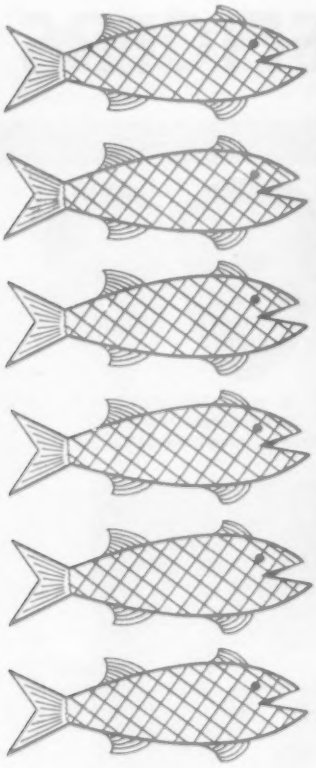
QUALITY YOUNGSTOWN SERVICE

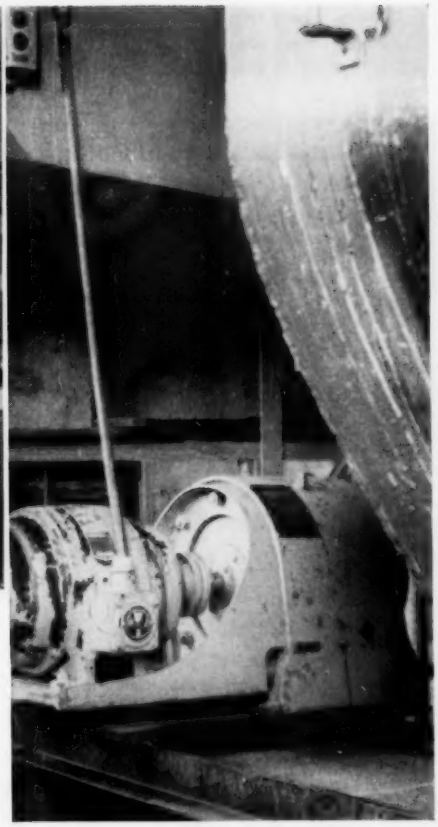
●You can be sure of prompt delivery of Buckeye rigid steel conduit, because your Youngstown Distributor keeps ample supplies on hand and checks his stock regularly. His careful planning helps you keep jobs on schedule and meet emergency needs. Your Youngstown Distributor is as handy to you as your 'phone. Rely upon him whenever you need quick service on delivery of good steel conduit.

THE YOUNGSTOWN SHEET AND TUBE COMPANY *Manufacturers of Carbon, Alloy and Yoloy Steel*

General Offices: Youngstown, Ohio - District Sales Offices in Principal Cities

SHEETS - STRIP - PLATES - STANDARD PIPE - LINE PIPE - OIL COUNTRY TUBULAR GOODS - CONDUIT AND EMT - MECHANICAL TUBING - COLD FINISHED BARS - HOT ROLLED BARS - BAR SHAPES - WIRE - HOT ROLLED RODS - COKE TIN PLATE - ELECTROLYTIC TIN PLATE - RAILROAD TRACK SPIKES





Motors on automatic fish processing line at a Washington cannery, showing flexible leads of tough, water- and oil-resisting TIREX SO Cords that work in a shower of fish cleanings and steam.

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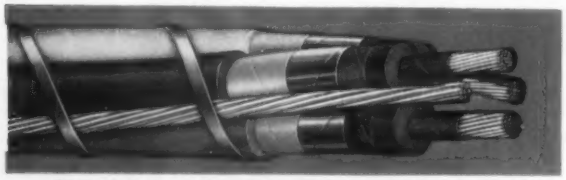

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54th Year —AUGUST • 1955

Rewiring Potential

Awakening public interest in wiring is being further stimulated this year by, in many areas, a very hot summer. Hot weather sells room air conditioners and big fans. It also leads to porch and patio cookery with portable electrical appliances. Attempts to use the substantial quantities of electricity required inevitably uncover wiring system deficiencies.

It is getting a little easier to sell residential rewiring. The home owner is becoming conscious of the need for fixing up his wiring if he wants to use modern electrical equipment. More than likely he has had trouble or inconvenience and is inclined to welcome helpful proposals. He hopes it won't be too costly.

The potential market that is softening up for electrical contractors is so huge that totals look fantastic—from $5 to $15 *billions*. Trouble is those figures represent a vast number of comparatively small individual jobs, $100 to $500, each pretty much custom-tailored, expensive to sell and service and burdened with high overhead costs.

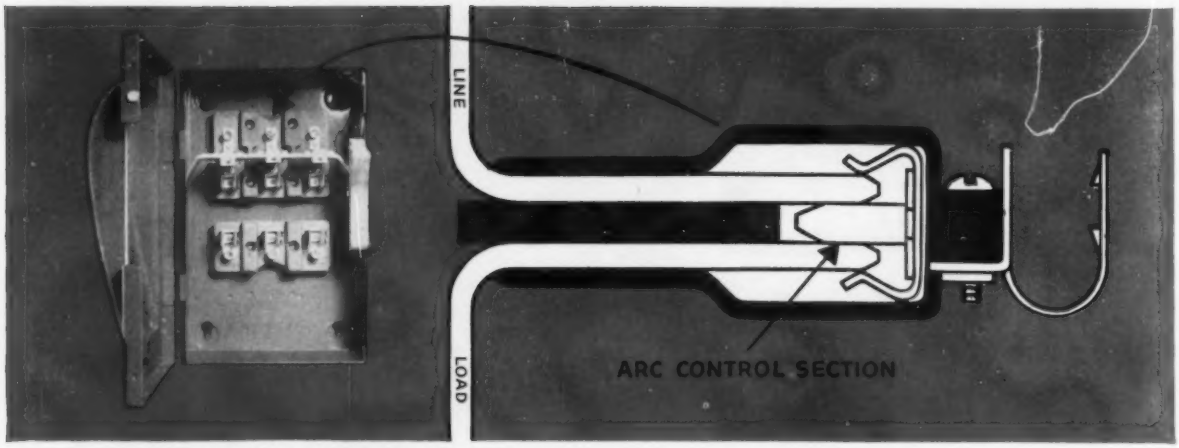
This aspect of residential electrical modernization is not often recognized by those outside the contracting business. Lack of enthusiasm on the part of many contractors for this "golden" opportunity may be entirely reasonable and prudent. The potential jobs are a class of work not particularly attractive to the highly-efficient, volume-oriented, low-overhead organizations which are necessary to compete effectively in the new construction field.

Some electrical contractors who have been notably successful in residential modernization handle such work out of a separate department, in some cases through a separate company. From initial promotion to final collections, residential modernization differs significantly from most of the familiar patterns of new construction activity. Whether handled in a separate department or absorbed into existing organizations it is important that residential modernization be given an opportunity to stand on its own. Nothing will stimulate more enthusiastic and effective exploitation of the vast potential market than a clearly identifiable profit from it.

Residential rewiring work is not going to be equally attractive to *all* electrical contractors. The best of the market will go to those who want this class of business; those willing to build organizations and develop methods to make it profitable. But all electrical contractors have a stake in the industry-wide job of getting homes rewired.

Sub-standard, limited-use electrical systems in homes affect public attitudes. Public attitudes are carried into civic councils, school boards, stores, offices and factories. They influence budgets for electrical work and standards of acceptable electrical performance. So if we expect to find public support for continued electrical growth a big rewiring job has got to be done.

Wm. T. Stuart



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ELECTRICAL WORK IN A TUNNEL

Electric power distribution and utilization are highlights of the engineering accomplishment represented in the Baytown-LaPorte Tunnel, near Houston, Texas. Here is a close look at some of the electrical installation details. Parsons, Brinckerhoff, Hall and MacDonald, New York City, were engineers of the tunnel.

By Larry Schwing, Superintendent, Muhl Electric Limited, Houston, Texas

ELECTRIFICATION of the Baytown-LaPorte Tunnel, near Houston, Texas, includes a wide range of power and light circuiting. The overall electrical system serves a heavy load of ventilation blowers, many pumps and numerous lighting arrangements. A study of this electrical system affords a clear understanding of the type of work encountered in a modern tunnel.

The electrical system for the tunnel originates in the ventilation building which is built above the tunnel, straddling it at the Baytown end. Fig. 2 is a single-line diagram of the hook-up of distribution equipment on the ground floor and first floor of the ventilation building. Two unit substations are installed in a room on the ground floor. Each substation is fed by a separate 3-phase, 12-kv incoming line. Substation No. 1 is fed from a 12-kv utility pole line at the LaPorte end of the tunnel, and substation No. 2 is fed from another pole line at the Baytown end of the tunnel. From the pole line at the Baytown end of the tunnel, the 12-kv feeders to the ventilation building make a short underground run from a dead-end pole. The 12-kv feeders from the pole line at the LaPorte end of the tunnel run underground for the length of the tunnel to the ventilation building.

The two sets of 12-kv primary feeders—each set consisting of three, single-conductor No. 4, 15-kv VCL cables—enter the ventilation building underground in conduit through opposite sides of the building—one through the building wall into the basement and one through the wall on the opposite side of the building into the sub-basement. Each conduit run is carried horizontal within the building to a point below the 12-kv service bay on the ground floor of the ventilation building. The conduit runs then rise, one from the sub-basement and one from the basement, into the service bay. Each of the two conduit runs couple into a stuffing box on a pothead entrance to a load-break oil switch. The three incoming lead

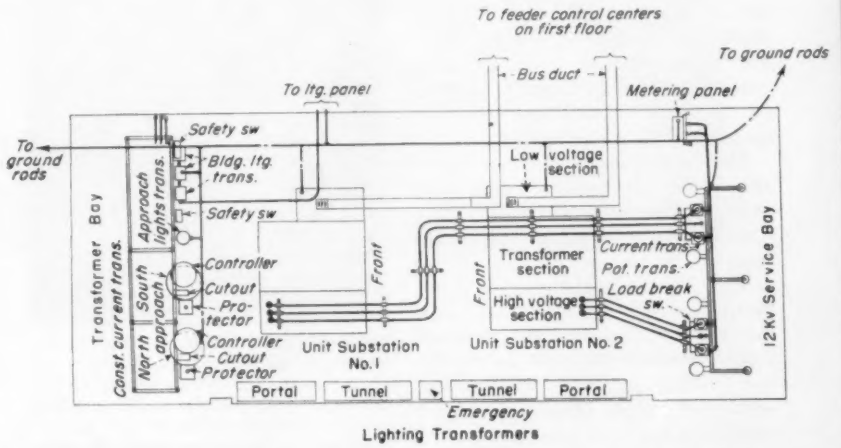


FIG. 1—Plan of ground floor electrical room shows layout of substations, 12-kv service bay and transformer bay.

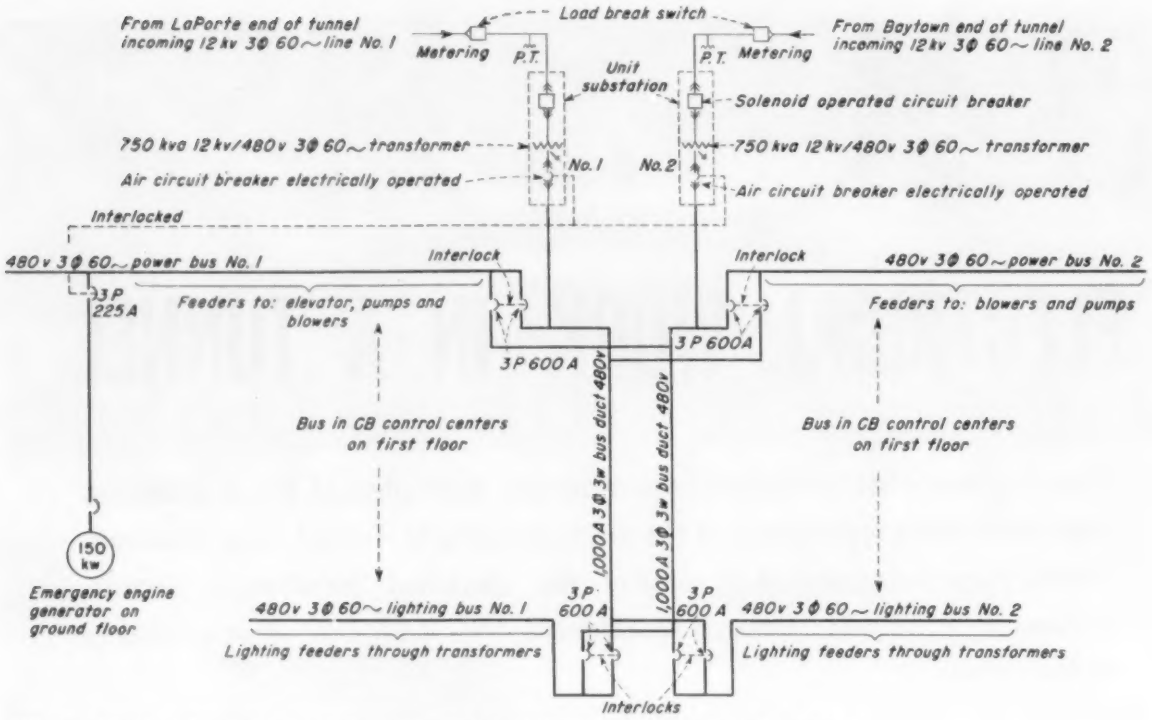


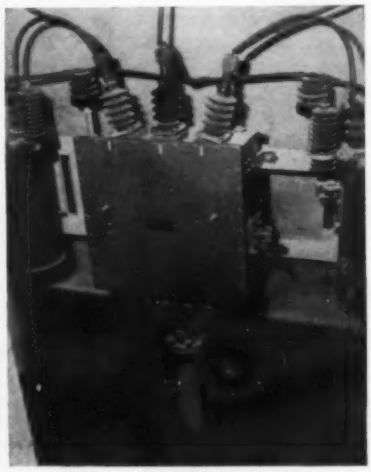
FIG. 2—Single-line diagram shows basic arrangement of substations and feeder control centers.

cables of each feeder are terminated in the switch enclosure. From each switch, power is carried to one of the unit substations.

Each of the unit substations is fed by three 12-kv cables, rack-suspended from the ceiling and running from the 12-kv service bay to the top of the substation enclosure. Fig. 1 shows the layout of the unit substations and other equipment in the electrical room on the ground floor. As indicated, the 480-volt output of each unit substation is carried by a 1000-amp, 480-volt, 3-phase bus duct to control centers on the first floor. The two bus ducts are carried horizontally from the electrical room, supported by hangers from the ceiling, to a point on the ground floor where they turn up into the control centers.

The control centers are typical enclosed-unit CB panels. From these panels, various 480-volt feeders supply light and power requirements of the tunnel. The two power buses shown in Fig. 2 feed a total connected motor load of over 850-hp, including: building elevator, booster and deepwell pumps, drainage pumps in the ventilation building and at the South portal, mid-tunnel pumps, blowers for tunnel ventilation and other pumps.

Five lighting transformers are mounted against a wall in the ground floor electrical room and fed from the lighting panels in the first floor control centers. Four of these transformers—each a 30-kva, 3-phase, 60-cycle, 480/600 volt unit—supply main tunnel and portal lighting. The fifth transformer is a 3-kva, single-phase, 60-cycle, 480/600-volt unit supplying emergency tunnel lighting. Lighting in the ventilation building and the outlying garage and maintenance building is supplied from a 30-kva, 3-phase, 60-cycle, 480/120-208-volt transformer in the ground floor electrical room. This transformer is fed from the lighting panel in the first floor control center. One 2-kva, single-phase, 60-cycle 480/120-volt transformer is mounted in the South sump and pump room; another is in the mid-tunnel sump and pump room. These units supply traffic signal lights.

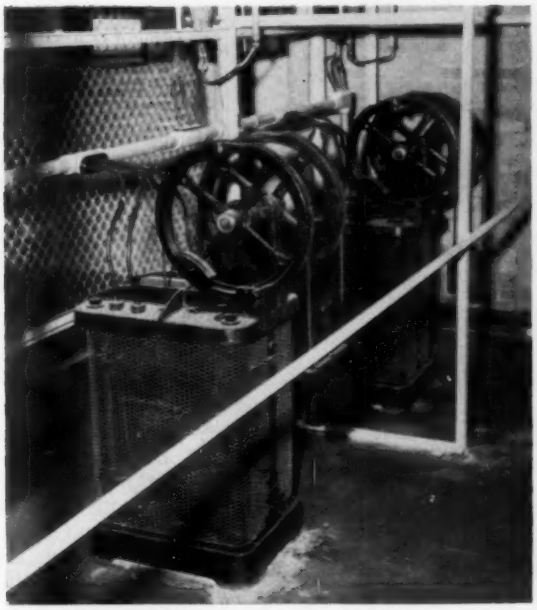


LOAD-BREAK SWITCH in 12-kv service bay in ground floor electrical room is one of two such units. 12-kv service feeders come up through floor in conduit and feed through oil-filled switch to unit sub via overhead cables on insulators. Potential transformer is shown on each side of switch.

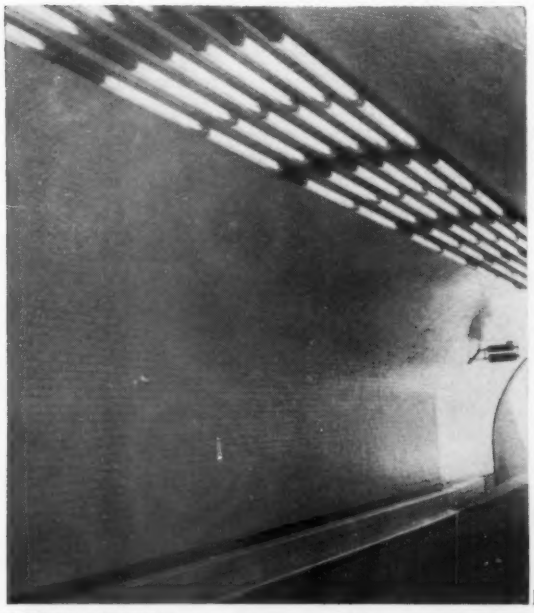
Feeders for North portal, South portal, main tunnel and emergency lighting are carried in conduit from the 480/600-volt transformers in the ground floor electrical room down into wire troughs to which fluorescent fixtures are attached along the ceiling of the tunnel, which runs under the basement of the ventilation building.

Tunnel lighting is provided by 15-ft slimline fluorescent luminaires surface-mounted to the wiring trough set in the tunnel ceiling. Each unit contains two 72 T12 slimline lamps mounted end-to-end within the fixture, with the ballast in a housing between them. For a distance of 300 ft along the tunnel ceiling at each end, there is an extra heavy concentration of luminaires to minimize the unfavorable blinding effect on the eyes of motor vehicle op-

LIGHTING TRANSFORMERS (two of five shown here) are mounted against wall in ground floor electrical room. Units are 3-phase, 480/600 volts, supplied through 60-amp switches by conduit from lighting control centers on the floor above. Output of transformers is carried down under the basement of the building into the tunnel below, where fluorescent luminaires are mounted along the ceiling.

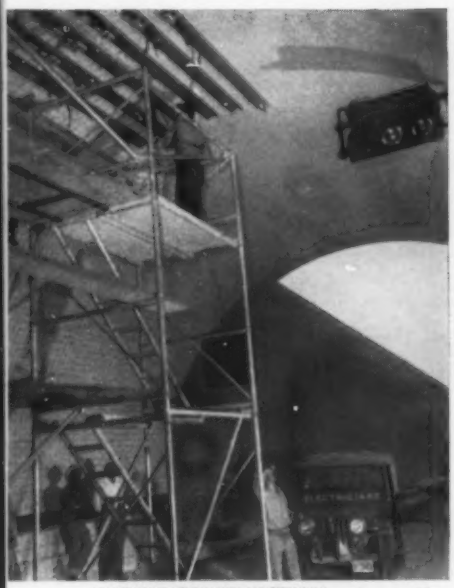


CONSTANT-CURRENT regulators are shown here mounted in ground floor electrical room. Each unit maintains constant current through series-connected approach lights at one end of tunnel. Both regulators are fed from a 10-kva, single-phase 480/2400-volt transformer nearby. Cutouts, protectors and controllers associated with the series lighting circuits are shown at upper left, mounted on angle iron rack.



TUNNEL LIGHTING for a length of 300 feet at each end consists of six rows of 15-foot, ceiling-mounted, clear plastic shielded fluorescent luminaires, each containing two 72 T12 lamps mounted end-to-end with their ballast housing between them. Each ballast is a 600-volt unit for 430-ma operation of the lamps. For the main length of the tunnel, two rows of the same ceiling-mounted luminaires are used. Lighting load is balanced among three 600-volt, delta-connected phase conductors from each of four 3-phase 480/600-volt lighting transformers. A single-phase, 3-kva 480/600-volt transformer supplies emergency luminaires in one row of main lighting.

CABLE ROOM on sub-basement level in ventilation building is a closet down into which feeders for two 2-kva, single-phase 480/120-volt lighting transformers and various power, signal and control circuits pass from first floor control centers. Conductors are carried out of closet, through concrete-encased ducts shown, into a junction box under sidewalk along side of tunnel roadway. From box, conductors are carried in nine 3-in. fibre-duct lines along the tunnel. The fibre-duct lines are set in the concrete sidewalk alongside the tunnel roadway, as shown in the photo of the sidewalk construction at the bottom of the next page.



DURING CONSTRUCTION, a jeep with a reel of rope mounted on front bumper was used to pull lighting circuits in trough.

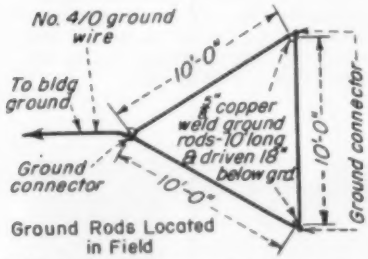


FIG. 3—Equipment ground is made by connecting grounding wire network to ground rod arrangements at several locations outside the building. A typical arrangement of rods is shown here.

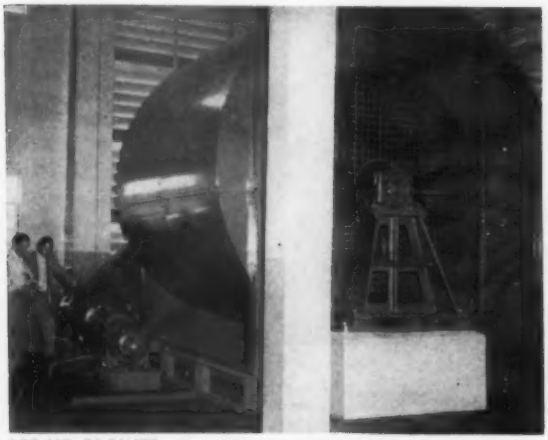
erators as they pass from the very bright outdoors into the relatively dark interior of the tunnel. The use of more lighting units for a short distance from each portal into the tunnel allows gradual accommodation of the eyes to the lower light intensity used for the major length of the tunnel. At each end, six rows of 430-ma, 2-lamp, 15-ft luminaires—20 luminaires per row—are used. The main length of the tunnel—about 2400 ft—is lighted by two rows of 200-ma, 2-lamp, 15-ft luminaires of the same type. Emergency lighting in the tunnel is provided by 14 of the same luminaires connected on one single-phase circuit and spaced one every 13 units throughout one row of main lighting. All of the fixtures used have the two lamps mounted end-to-end instead of alongside each other as is the common arrangement.

The tunnel luminaires, except those on the emergency circuit, are balanced among the three secondary conductors from each of the 480/600-volt, delta-delta lighting transformers. Emergency luminaires are on the single-phase, 480/600-volt transformer. The ballast used in all luminaires is rated for operation of two 72-in. T-12 slimline fluorescent lamps on a 600-volt circuit. The use of 600-volt circuits minimizes voltage drop in the long wire runs along the tunnel and provides 430-ma current through the lamps.

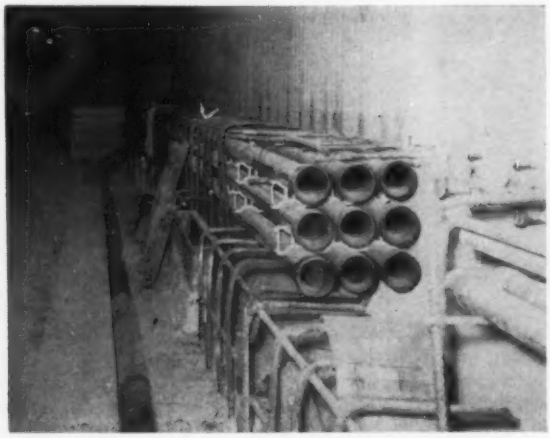
Provisions for emergency light and power are extensive. A 150-kw engine-generator is connected to one of the 480-volt, 3-phase power buses in the control center to provide power to motors if service fails. The CB which connects the generator to the bus is interlocked with the two electrically operated ACB's in the substations. Emergency lighting in the ventilation building and the outlying garage and maintenance building is provided by batteries which are connected to emergency lighting circuits through an automatic transfer switch upon failure of supply to the lighting panelboards. A 480-volt, 1-phase 5-kw ac generator on the mezzanine floor is connected to an automatic transfer switch to throw the generator on the emergency lighting transformer in the ground floor electrical room if tunnel lighting fails. A dc motor is used to drive the ac generator and is automatically connected to a bank of batteries upon failure of supply.

Typical installation details on this job are shown in the photos at the top left and bottom right of this page. Pulling the lighting circuits in the wire troughs along the ceiling of the tunnel would have been a difficult and time-consuming job had not the movable scaffold and jeep been used as shown. The jeep had a reel of rope mounted on the front bumper and was simply driven in reverse.

In addition to extensive power and light wiring, the job included conduit and wire for fire alarm, control, traffic signals and telephone. These conductors are run under the sidewalk along the side of the tunnel as shown in one of the photos. Overall, the tunnel is electrically modern and complete.



200-HP BLOWER shown here is one of three such units on first floor of ventilation building. Blower output is carried down into air ducts under tunnel roadbed. From the ducts air escapes into tunnel through ports along side of roadway. The 200-hp motor shown is supplied at 480 volts, 3-phase by three 350 MCM conductors in 3-in. conduit from power control center in adjoining room.



DUCT LINES, nine 3-inch fibre ducts, are shown here as they were set along tunnel in sidewalk at side of roadway before concrete was poured. Lines carry conductors for lighting, power, traffic signals, control, fire alarm and telephone. Along tunnel on opposite side of roadway, two 4-inch fibre ducts carry 12-kv incoming feeders from utility pole line at South end to substation No. 1 on ground floor of ventilation building.

Use of

MI CABLE IN HAZARDOUS AREAS

simplifies electrical installation at Standard Oil Company's bulk loading stations. Sauk Centre, Minn., project, wired by Commonwealth Electric Co., St. Paul, sets pattern for other stations.

OVERHEAD PRIMARY service terminates at transformer pole where underground conduit carries 440-volt cables to distribution center in operations building.

TYPE MI cable (mineral-insulated, metal-sheathed) has been installed in specific types of hazardous areas on a number of midwest projects constructed by the Standard Oil Company (Indiana). This is particularly true in cases where the existing hazard can be considered in the "twilight zone" of the explosion-proof category. Standard's electrical engineers have placed bulk loading station control centers in this classification—principally because the operations are out in the open and all motors and switching equipment are kept more than 18 inches above ground level.

It is in this type of plant that Standard has made the switch from an all-conduit, explosion-proof electrical installation to a combination of conduit and MI cable circuits. As in the past, all junction boxes, switches, circuit breakers, lighting fixtures and other electrical equipment are of the explosion-proof and vapor-proof types. The main difference is that most of the circuits from control points to motors, fixtures, etc., are MI cable either buried directly in the earth or mounted on structural steel.

A number of reasons led to this change in electrical system design. Among those listed by Standard engineers are the following:

1. Chance of failure of MI cable circuits, when properly installed, is quite remote.

2. MI cable is considered safer than conduit and wire since there is no air space between conductor and protective sheath where vapor or moisture pockets can form.

3. This type of cable is easier to install because it can be trained easily around structural obstructions and mounted in limited space. Also, it can be buried directly in earth for underground runs.

4. Outdoor control racks can be more compact since numerous short conduit nipples, offset fittings and sealing fittings are eliminated.

Standard's bulk loading plant at Sauk Centre, Minn., was one of the first to use MI cable circuits and is a prototype of others being built in a number of midwest states. Here, primary 2,300-volt overhead service terminates at three 25-kva, 2,300/440-volt, single-phase, pole-mounted transformers. Three-phase, 440-volt power is carried underground in conduit and cable to a distribution center in the operations building (non-hazardous area). At this point a 10-kva, 440/110/220-volt, air cooled transformer provides single-phase power to building lighting and small motor loads.

Outside Equipment

Power for outdoor facilities is provided by a 3-phase, 440-volt, underground conduit and cable feeder originating at a 200-amp fused switch in the operations building. This circuit terminates at the explosion-proof outdoor starter and control rack centrally located between the loading platform, manifold building and outdoor pumps. One side of the rack supports

MI Cable and the Code

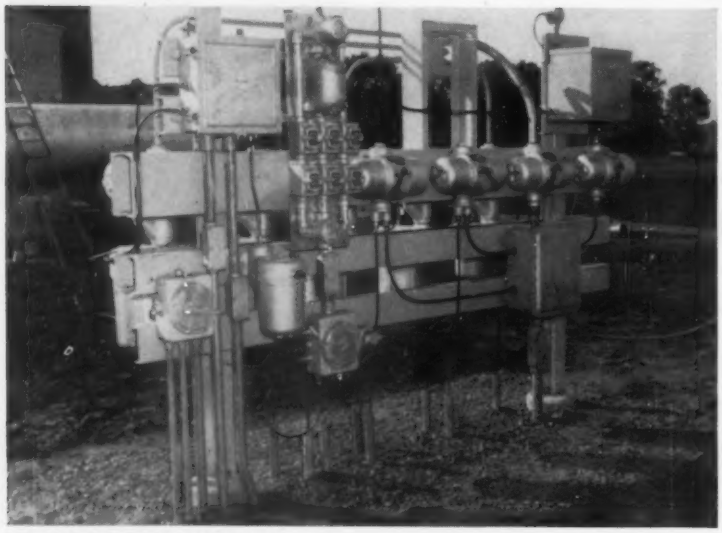
This report covers a new application of mineral-insulated cable to wiring in a hazardous area. It may raise some question as to authorization by the National Electrical Code. Here is the present status insofar as the Code is concerned:

Article 330 states "Mineral-insulated, metal-sheathed cable may be used . . . where exposed to weather or continuous moisture, for underground runs and embedded in masonry, concrete or fill, in buildings in course of construction *or where exposed to oil, gasoline,* or other conditions not having a deteriorating effect on the metal sheath."

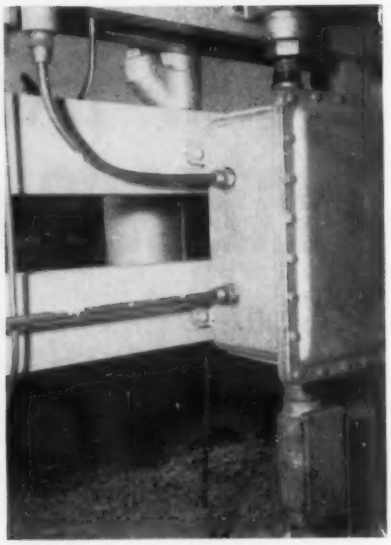
Code Section 3308 further states "When Type MI cable is connected to boxes or equipment, *the fittings shall be approved for the conditions of service.*" This is the focal point of any controversy which may ensue. A check with Underwriters' Laboratories reveals that, at present, there is no MI cable fitting and seal approved for use in hazardous locations. To be so approved, it would have to be safe for the highest degree of hazard which might be encountered.

Standard's MI cable installations have been approved by the electrical inspection authority having jurisdiction in the areas involved. Such sanction was based on his interpretation and decision as to the degree of hazard existing in each specific installation.

Until such time as an MI cable fitting and seal for hazardous locations is developed and listed by UL, and recognized in the N.E.C., it is recommended that engineers and contractors designing and installing such systems in hazardous areas first check with the local electrical inspection authority and secure written approval for each specific installation. —Editor

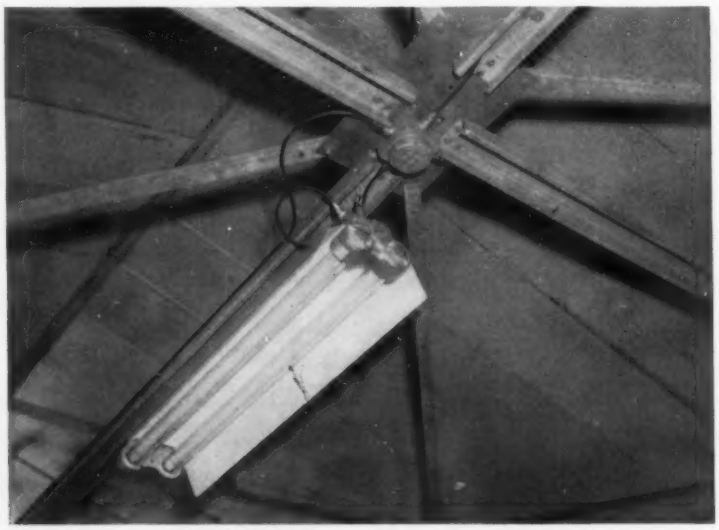


OUTDOOR EXPLOSION-PROOF starter rack concentrates control equipment at central location. MI cables connect feeder junction box to main breakers serving motor group with master 110-volt control unit, lighting transformer and MI cable underground circuits to pumps, loading dock and manifold building.



CLOSEUP OF MI CABLE connections between feeder junction box and circuit breaker housing shows simplicity of cable installation and termination at hubs.

MOTOR CONNECTION on outdoor pumps is simple and neat. MI cable leaves conduit sleeve in wide sweep to enter cable box, eliminates need for flexible connection. Separate ground conductor for each motor.

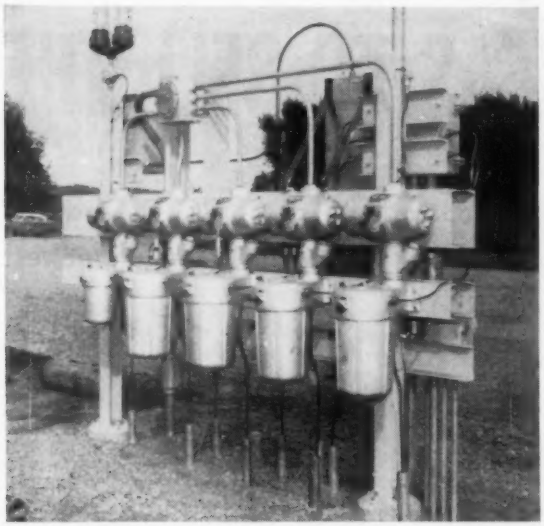


EXPLOSION-PROOF FLUORESCENT fixtures in manifold building are connected to MI cable circuit mounted to roof steel channel. Junction box is terminal for circuit and switch leg cables. Use of Mineral-Insulated cable eliminates the time-consuming work involved in installing and filling numerous seals and other special fittings.

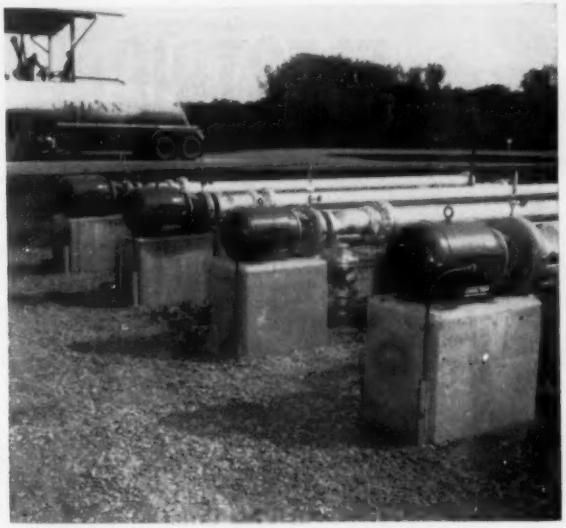
a 10-kva. lighting transformer and main breakers for the group of pumps and circuits radiating from this point. The other side of the rack supports five explosion-proof circuit breakers and motor starters which individually control pump motors ranging from 7½-hp to 15-hp in size.

Mineral-Insulated cable circuits are run underground (direct burial) from the rack to the manifold building, loading dock and outdoor pumps. Wherever the cable enters or leaves the trench it is mechanically protected by conduit sweep-ell stubups. Where feasible, short lengths of MI cable interconnect junction boxes and control equipment on the rack. This type of wiring is also used for lighting branch circuits and switch control on the loading dock and in the manifold building. MI cable on this project ranged in size from 2- and 3-conductor No. 12 to 3-conductor No. 6.

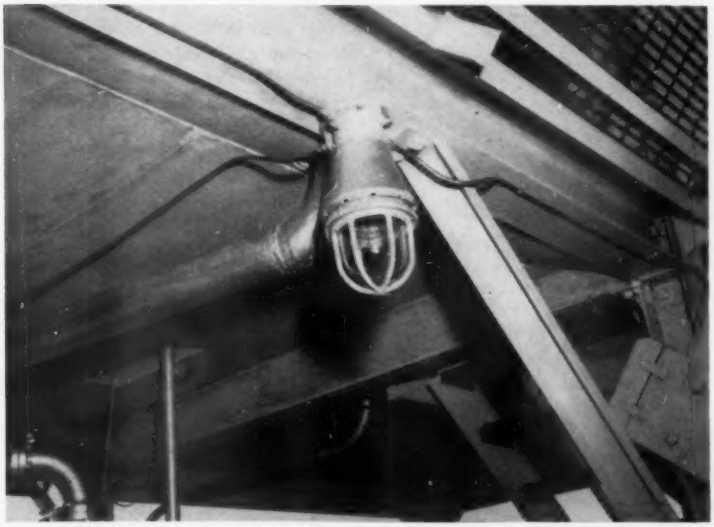
Commonwealth's field supervisor on the Sauk Centre (and Jamestown, N. D.) project confirmed Standard engineers' contention that MI cable is easy to use. Installation man-hours on some circuits totalled approximately



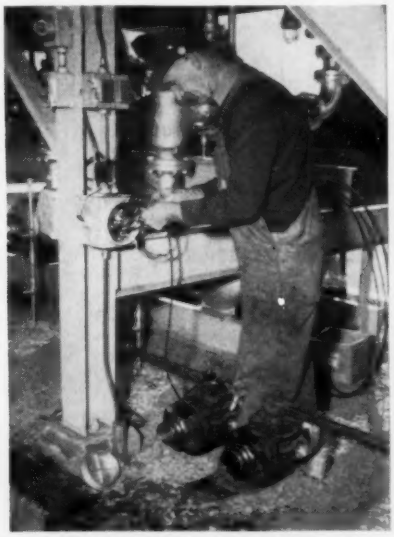
MOTOR CONTROLS on back of outdoor rack consist of explosion-proof circuit breakers and motor starter assemblies ranging from 7½ hp to 15 hp size. MI cable circuits go underground, through conduit stubups, to five outdoor pumps.



OUTDOOR PUMP motors, of explosion-proof type, rest on concrete pedestals well above ground level, are connected to underground MI cable circuits. Tank truck loading dock is in background.



LOADING DOCK LIGHTING units, both under and above platform, are fed by MI cable circuits. Note ease with which cable is trained around structural steel. Cable is supported by simple straps which can be secured to structural members by drilling and tapping or by use of powder-driven studs. For such installations, fixtures and fittings must be ordered with mounting lugs.



JUNCTION POINT for dock lighting is this explosion-proof box fed by underground Mineral-Insulated cable circuit from control rack. Note cable connections to switches and pilot lights.

half of those normally required for similar conduit and cable runs for installations of this type. Most of this saving was attributed to the elimination of numerous short nipples, sealing fittings, conduit offsets and cutting and threading both at the control rack, manifold building and loading dock. This was particularly apparent at points where circuits had to duck under, around or over structural steel obstructions. Elimination of wire pulling on MI circuits also helped.

Once the electricians became familiar with the technique of installing the threaded gland fittings and "screw-on pot" seals, time per MI cable termination at outlet boxes and equipment enclosures was reduced to about 10 minutes per cable end.

Standard's experience with MI cable circuits in bulk loading plants has been so satisfactory that their electrical engineers are considering extension of the system to other applications where the degree of hazard will permit. Successful installations already have been made on conveyor motor control in warehouses handling packaged product.

TRY THESE

ELECTRICAL IDEAS TO SELL THE

and add "plus" business to your contracting operation. Advanced adequate wiring techniques demonstrated at model home in newest residential subdivision in Elmhurst, Ill.

ALL-ELECTRIC KITCHEN includes built-in oven, range, dishwasher and garbage disposer; refrigerator; ceiling and soffit lighting; illuminated exhaust hood; four triplex, two-circuit receptacles; telephone; planter lighting plus light in broom closet.

MASTER INTERCOM station is in kitchen between work and dining area. Panel has six-station dial for speakers at front and rear entrances, master and child's bedrooms, recreation room, hobby room and laundry.

IDEAS for "plus" wiring abound in Holiday Home, a completely furnished and extraordinarily electrified model home in Brynhaven, a new residential subdivision in Elmhurst, Ill. Part of a 400-home project being built by Cooperative Home Builders, Chicago, the unit was light conditioned and electrically outfitted in cooperation with the Public Service Company. Prime goal is to stimulate public interest in electrical convenience and demonstrate the most advanced residential use of electricity.

The project offers five basic split-level and ranch type designs in a $23,000 to $33,000 price range. Square foot area varies from 1143 to 1436. Each unit has 3 bedrooms, 1½ baths. full basement and garage.

All homes in the group will have Certified Adequate Wiring with a 100-amp, single-phase, 3-wire service and from 14 to 16 branch circuits. Standard equipment includes an all-electric kitchen consisting of a built-in oven, table-top pushbutton range, automatic dishwasher, 11 cu ft refrigerator, garbage disposer and exhaust fan. Also an automatic laundry consisting of an electric clothes washer and dryer. Wiring and outlet for future addition of a 3-ton air conditioning unit to the forced air heating system is included in the basic building. Other electrical requirements meet AW standards.

Wiring in Holiday Home, largest of the five basic models, goes far beyond the AW package in the standard home. In this finished basement ranch type, air conditioned unit, the electrical system is designed to provide the ultimate in gracious electrical living. In all, there are 32 circuits serving approximately 76 convenience and special purpose receptacles plus some 62 lighting outlets. More than 80

HOME OWNER

EXTERIOR LIGHTING is provided around house by recessed incandescent units in eaves controlled by master switch. Patio is illuminated by two floodlights under eaves and outlined by garden lights. Time-clock controlled post light at front and four weatherproof outlets around house complete outdoor electrical system.

low-voltage remote control switches, including three master stations, assure convenient, multiple-switching of lighting units.

Dimmer-controlled cornice and recessed lighting are custom-built into both living room and basement recreation room. Soffit units light the kitchen work area. Recessed lighting is predominant throughout the home with accent on both functional and decorative application. Multiple TV and telephone outlets and a 6-station intercommunication system add to living convenience. A closed-circuit fire detection and alarm system plus built-in outdoor eave lighting comprise safety features. The garage door is electrically operated. The front lawn post light is time-clock controlled. Even the picture-window draw drapes are electrically opened and closed.

A number of these "plus" electrical features are illustrated in the accompanying photographs. Others are in the check list offered as a handy reference for the electrical contractor. All are sound, practical applications which have generated considerable interest among the people visiting the demonstration home. Returns to the Public Service Company of check-list cards passed out at the home are most encouraging. And Gerson Electric Company, Chicago, the project electrical contractor, reports a substantial number of inquiries for quotations on a variety of items coming from persons buying homes in Brynhaven.

Lack of knowledge on the part of the public is the first salesblock to upgrading wiring. Demonstration homes, like this, effectively hurdle this obstacle by showing people what can be done electrically. Once a person sees and evaluates these "plus" features, he becomes an interested prospect and

CHECK-LIST OF "PLUS" ELECTRICAL FEATURES TO SELL THE HOME OWNER

No.	ITEM	✓
1.	100-ampere, 3-wire, 120/240-volt service	
2.	All-electric kitchen (range, oven, refrigerator, dishwasher, garbage disposer).	
3.	Soffit lighting over kitchen work area.	
4.	Range ventilating hood with built-in fan and light.	
5.	Automatic laundry (electric clothes washer, dryer and ironer).	
6.	Additional circuits and outlets.	
7.	Multiple telephone jack outlets.	
8.	Multiple TV outlets.	
9.	Triplex receptacles — two-circuit and split wired.	
10.	Duplex, 2-wire, grounded safety type receptacles.	
11.	Continuous-channel, multiple duplex receptacles a. Under living room picture windows b. Around walls of hobby room (120- and 240-volt)	
12.	Low-voltage, remote-control switching of lighting with master stations.	
13.	Central air conditioning; or individual room air conditioning.	
14.	Germicidal lamp air purifier in furnace air duct.	
15.	Electric incinerator.	
16.	Fire alarm and detection system.	
17.	Built-in night lights in bedroom corridors.	
18.	Intercommunication system with master panel in kitchen and speakers at entrances and in various rooms.	
19.	Cornice fluorescent lighting in living, recreation and bedrooms.	
20.	Recessed lighting in dining, living and recreation rooms.	
21.	Dimmer control of accent and decorative lighting in dining, living and recreation rooms.	
22.	Dual recessed lights in wardrobe closets, controlled by exterior switch.	
23.	Luminous ceiling in powder room.	
24.	Adjustable reflector sun lamps in bathroom.	
25.	Combination ceiling light and electric heating element, or supplementary electric wall heater in bathroom.	
26.	Time-delay switch control of bathroom exhaust fan and electric heating unit.	
27.	Exterior protective lighting with recessed units in eaves — controlled by master switch in bedroom and/or other location.	
28.	Patio floodlighting and garden outline lighting.	
29.	Multiple, outdoor weatherproof receptacles.	
30.	Electric garage door opener.	
31.	Motor-operated draw drapes over picture windows.	

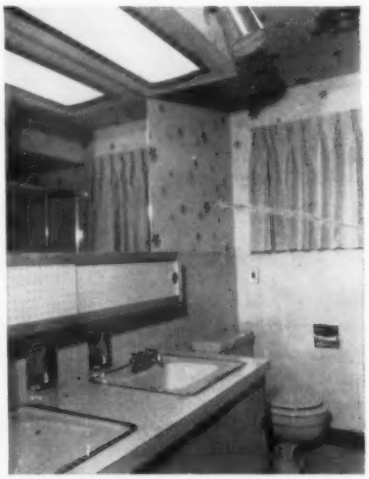
ACCENT LIGHTING flexibility in dining area is provided by three recessed reflector flood units and one adjustable-beam pinpoint spot. Floods are controlled by a wall switch and dimmer; spot by a separate wall switch and dimmer.

CORNICE LIGHTING accents motor-operated drapes on two picture windows in living room. Recessed ceiling reflector flood highlights fireplace. Room has five triplex wall receptacles plus seven duplex receptacles in continuous strip.

COMBINATION OF recessed incandescent ceiling units and dimmer-controlled fluorescent cornice lighting provides basement recreation room with illumination to fit any activity. Room has five duplex, grounded receptacles, TV outlet, telephone, built-in speaker for movie projector or record player.

DIMMER CONTROL is used on lighting in recreation, living and dining rooms. Low-voltage remote control switching is used throughout house with nine-station, master control in garage, recreation room and master bedroom.

CONTINUOUS CHANNEL around three sides of hobby room provides 16 duplex, grounded receptacles. Three of them are 240 volt. Lighting consists of asymetric fluorescent units over work areas and recessed incandescent ceiling fixtures. Room has telephone, intercom speaker and fire alarm thermocouple.



BATHROOM has recessed fluorescent unit and incandescent tub fixture; two 275-watt adjustable reflector sun lamps; exhaust fan controlled by time-delay switch. Fluorescent unit has four switches: one in bathroom and one in each of three bedrooms.

a potential buyer. Enterprising electrical contractors take the initiative at this point and promote the sale from the standpoint of customer benefit. On projects of this type, where homes are sold before construction is completed, they point up the economy of having additional electrical work done while the house is being built. Also, present day financing permits several hundred dollars of additional electrical work for only a few dollars added tc monthly payment.

Study this list carefully and check those items you feel will appeal to residents in your area. Work with builders, first to secure an Adequate Wiring package then to add as many "plus" electrical features as are feasible. All add to the sales appeal and livability of a home.

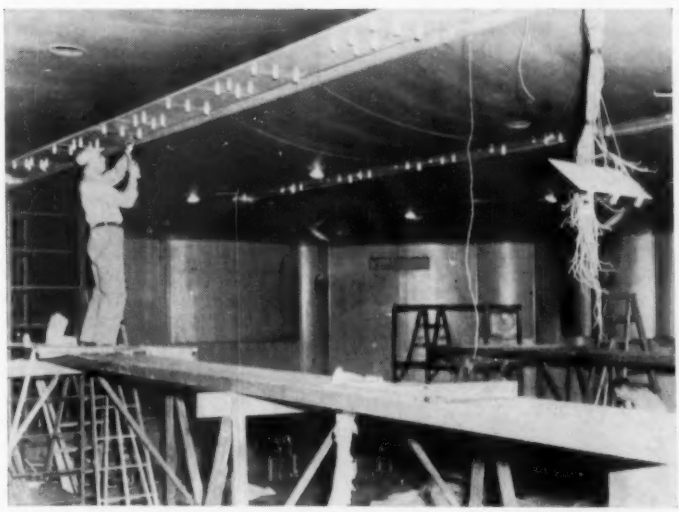
Try these electrical ideas to sell the home owner and build a list of grateful customers. By doing so you will be adding to your volume and raising the standards of residential wiring.

Custom Lighting in an Auditorium

How modern lighting technology, sound engineering practice and skilled electrical construction were combined to produce a custom visual environment in the auditorium of the Esso Research Center, Standard Oil Development Company, Linden, N. J. Joseph J. Tomasulo & Co., electrical contractors and engineers, Roselle Park, N. J., made the installation.

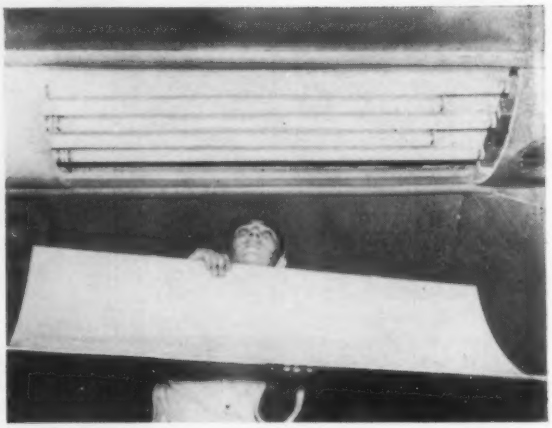
MODERN lighting—in the fullest sense of the words—is today a prominent feature of the completely oak-paneled auditorium at Esso Research Center, Standard Oil Development Company, Linden, N. J. Here. relighting has created a custom visual environment matched to the seeing requirements of auditorium activities. The finished installation and the lighting result it effects are products of close, on-the-job cooperation between: Joseph J. Tomasulo & Company, electrical contractors, Roselle Park, N. J.; Leo Flannery of Monogram Lighting Units, Inc., East Orange, N. J. and John Edelstein and Clyde Nordheimer, engineers for Gruber Lighting, Brooklyn, N. Y., designers and manufacturers of the custom lighting system.

Originally, this auditorium was lighted by recessed, open-bottom, baffled, R-lamp downlights in the oak



CONTINUOUS ROWS of the shallow luminaires were installed in place of 2-foot wide sections of curved ceiling panels, between 8-foot wide panels. Installation was made from scaffolds as shown.

LAMP SOCKETS were wired individually to remote single-lamp ballasts; color-coded conductors for circuits to ballasts were matched and spliced in luminaire housing.



PLASTIC SHIELDING is made of 4-ft sections, curved in cross-section and easily removed from unit to allow maintenance. Staggered positions of lamp ends are shown.

panel ceiling which has a wavy cross-section as shown in an accompanying illustration. The lighting result was totally inadequate for seeing tasks associated with regular sales meetings and similar activities held here. The lumen output of the units was insufficient; light intensity was spotty and uneven due to the spacing of the fixtures.

On the basis of consultation between the electrical contractor, the lighting manufacturer and the customer, a plan for relighting was evolved. The plan called for a complete, thorough modernization of lighting to properly coordinate with acoustical and air conditioning treatments. For budgetary purposes, however, the job was divided into two stages. The first stage to be done in 1954, consisted of installing the lighting system; the second stage, to be done in 1955, consisted of putting in a system of electronic thyratron dimmer equipment to control the lighting system. This story covers the first stage of the job and how the work is related to the overall job.

Seeing tasks in the auditorium included: reading programs, reading sales literature, making notes, and considerable close reading and writing in the front of the auditorium where a table is set up and used for board meetings. To meet these requirements, the new lighting system had to provide sufficient footcandle intensity for close but intermittent reading and writing, with freedom from objectionable glare. And because the ceilings and walls are wood paneling, brightness ratios had to be observed and maintained within prescribed limits. Uniformity of lighting intensity and a becoming appearance of the lighting equipment were also design objectives of the relighting job.

One of the most important objectives was dimmer control for variation of the lighting intensity. Although installation of the dimmer equipment is yet to be made, all of the special electrical circuiting for this control was completed during the first stage of the job. Actual hookup of the dimmer units during stage 2 will consist of only a minimum of wiring connections; the work done in stage 1 took into account the installation later of dimmer units.

The new lighting system consisted of four, 32-ft, recessed continuous rows of translucent Plexiglas-shielded fluorescent luminaires. Rows are 24 inches wide and shielded by flesh-toned Plexiglas which is curved in cross section. The curved cross-section of plastic shielding on each row assures maximum light diffusion and provides light on adjacent ceiling paneling to reduce harsh contrast between the luminaire and the oak ceiling. Plexiglas units were selected for several reasons:

1. Plexiglas shielding could be made with a curved cross-section to simulate the shape of the curved cross-section panels which were removed to make room for the luminaires;
2. Ease of maintenance;
3. Sound absorption coefficient of the plastic panels is very close to that of the wood paneling, maintaining the acoustic status quo; and
4. Plastic offered the even brightness characteristics required for effective application of dimming.

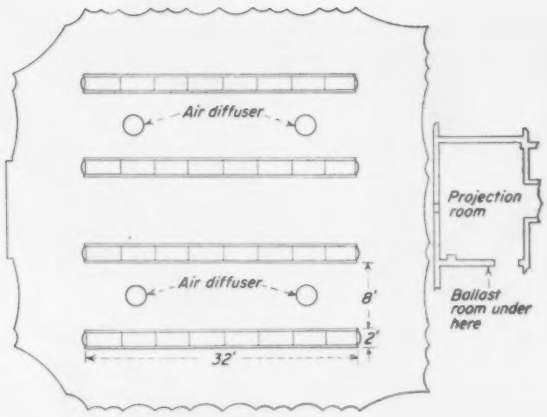
The plastic used on the luminaires was flesh-toned to blend in color with the oak ceiling and to further reduce ceiling brightness contrasts.

Within each luminaire row are five parallel and continuous rows of 40-watt, T-12 Rapid-start, deluxe warm white fluorescent lamps. Rapid-start lamps were used in this installation because of their perfect compatibility with electronic dimmer operation. Lamps are mounted on staggered socket arrangements which prevent the ends of adjacent lamps from being positioned alongside each other. This arrangement eliminates dark areas which would be created on the plastic if all lamp ends were mounted side by side. It also eliminates shadows on the shielding where the plastic panels meet each other. Each 32-ft row contains 38 lamps, making a total of 152 lamps for the four rows.

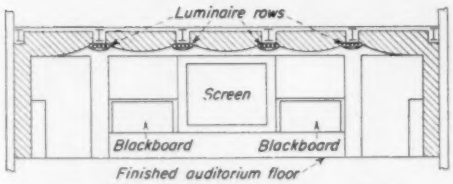
Each of the 152 lamps in the installation is individually wired to a single-lamp ballast remotely mounted in a bank of ballasts in a special space beneath the projection room at the back of the auditorium. There are 38 ballasts for each of the four units, again a total of 152. The ballasts are mounted in perforated metal cabinets in the special space which is forced-air ventilated to keep the ambient temperature within the safe value for proper ballast operation. The ballasts are divided among 16 such cabinets. Control of the ventilation blowers is tied into control of the lighting; ventilation starts when the lamps are turned on. Ballasts are now being operated on 220-volt circuits, with a booster transformer used to increase overall efficiency of operation. Installation of dimmer equipment will be made later on the same circuits.

The equipment used was selected

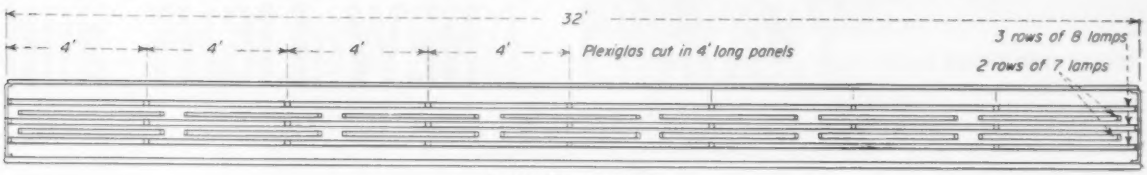
BALLAST HOUSINGS are perforated sheet steel enclosures mounted in forced-air ventilated space below projection room. Connections within housing are made on terminal block strips near top of housing. Conduit carrying lamp circuits runs up from this room and through wall to luminaires.



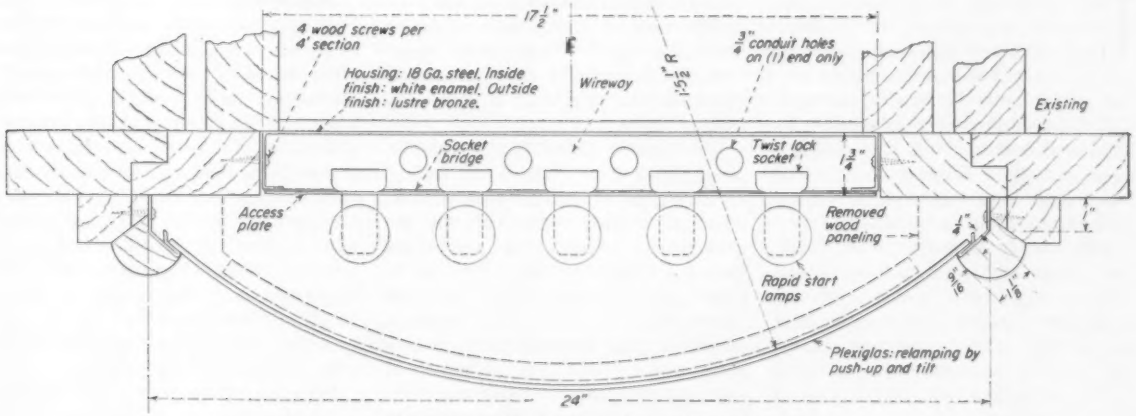
PLAN OF AUDITORIUM



SECTION – (LOOKING TOWARD STAGE)



PLAN OF LUMINAIRE



CONSTRUCTION DETAILS OF LUMINAIRE

as the best possible for the overall job, considering the dimensions of the interior, the lighting requirements and the need for dimmer control. The ballasts were remotely located to remove the noise and heat from the room and to minimize the space required for the luminaire. Wiring from lamps to ballasts is carried in conduit through the fixture housing.

Lighting results achieved with the new installation fulfill the original design objectives with the exception of dimming control to be added later. And only a minimum tearing out of the interior was required to make the installation. Connected lighting load (not including dimmers) of the lamps and ballasts totals 7.3 kw; total lighted area comes to 2600 sq ft; lighting intensity is 45 maintained footcandles. Reflectance factors of interior surfaces are as follows: oak ceiling, 48%; oak walls, 48% and tan rug, 55%.

Better operation of air conditioning equipment was also obtained with the new lighting system. The change from incandescent to fluorescent lighting and the remote installation of the ballasts reduced the heat load on the air conditioning. And the smaller amount of heat is better distributed among the air conditioning outlets. Absence of hot spots under the lighting and greater general comfort are the advantages derived.

SCULPTURED FRIEZE around upper perimeter of center circulation section, formerly unnoticed due to lack of illumination, is now prominently displayed beneath module pattern of 2-by-4 and 4-by-4-foot arched acrylic-paneled fluorescent surface-mounted fixtures. Lighting at reading level is 60 footcandles.

Relighting a half-century-old library building won public recognition, greatly boosted book circulation and merited a prize in EC&M's recent Lighting Competition for Electrical Contractors. It is also an example of top-flight promotion, financing, industry-wide cooperation, design and distribution modernization.

NEW LIGHT and

THE relighting of the Ruben McMillen Free Library in Youngstown involved numerous problems related not only to lighting but to selling, design and distribution as well. The finished project resulted in recommendations by both the Youngstown and Ohio State Association of Librarians, as an example for other modernization projects.

The library lighting in 50 years, had progressed from gaslight to two different types of enclosing glassware to indirect incandescent fixtures. But the admitted need for another relighting venture was counteracted by a lack of funds, and bypassing this roadblock required considerable selling, planning, and promotion.

Our promotion included submitting numerous photographs of other high-quality lighting installations, conducting library officials on actual visitations to well-lighted public buildings, presenting all of the arguments of quality and quantity, and discussing a variety of lighting plans which were prepared with the cooperation of the Ohio Edison Company's lighting consultant Bob Zimmerman. Other helpful "assists" were also received from local jobbers and various equipment manufacturers. The scope of this promotional effort had little relation to the size of our first work order, however, for this initial authorization provided for the relighting of only one reading room.

We decided, however, to use this small order as an additional selling argument, so everything was done to make this a quality job. This was accomplished by installing continuous rows of suspended semi-indirect 2-lamp plastic-bottom Wakefield Star fluorescent fixtures; a solution that resulted in good eye comfort, freedom from glare, simplified blower-aided maintenance, and easy relamping. Fixtures were equipped with single-pin standard warm-white T-12 lamps, and were operated at 430 milliamps.

The ceiling was then painted a flat white, walls were refinished for a 40% reflection factor, a tan-asphalt tile flooring was installed, and blond furniture with a 50% RF was placed in position. Moreover, windows were equipped with pastel-colored Venetian blinds, thereby providing for the control of daylight while creating an interior surface having a 60% RF for improved night-time illumination and effectiveness.

Approval on the part of library officials, employees and the general public was instantaneous, causing the management to reconsider the problem of raising funds for the job's continuance. This was partially accomplished by postponing the erection of a new penthouse and the installation of a new elevator, and funds thereby became available for installing a new service entrance, main switchboard, new feeders, lighting panels and additional branch circuits. Authorization was also received for the relighting of the other reading rooms, plus the stack areas devoted to book storage.

Relighting these stack areas resulted in another marked improvement, since the original lighting had been particularly poor, being based upon the false premise that natural light passing through skylights in the roof would penetrate through four thick-glass floors to the bottom tiers of storage racks. This not being the case, lighting intensities at the lower levels were practically non-existent.

The relighting of this area was simple yet effective, utilizing continuous rows of single-lamp fluorescent reflectors equipped with cross louvers. Then, to reduce brightness of

FLOODLIGHTING of front entrance and exterior of building is accomplished by means of adjustable weatherproof lamp housings, equipped with PAR floodlamps, color roundels and metal mesh protective screens. Window draperies are side-lighted by vertical coves placed immediately inside the sash lines.

ILLUMINATION INTENSITIES in reading areas were boosted from 7 to 55 footcandles by installing continuous rows of semi-indirect 2-lamp plastic-bottom fluorescent fixtures, repainting walls and ceiling, installing pastel-colored Venetian blinds over windows, utilizing a light-tan asphalt flooring and blond furniture.

LIFE for an OLD LIBRARY

By William H. Axelson *Axelson Electric Company, Youngstown, Ohio*

lamps as viewed from right angles, special thin-plastic strips were added as side diffusion agents.

Again the results of the job proved to be a strong argument for continuing the improvement program, so we were assigned the problem of relighting the main 26-ft-high central circulation hall, plus the 4-level entrance and stairwell section of the building.

This part of the job proved to be the outstanding segment of the entire project, for the relighting of this hall restored the originally-planned effect of a sun-drenched court. And, for the first time in many years, it became possible to plainly see and appreciate a 5-ft-high sculptured frieze that surmounted the upper perimeter of the room. This frieze—a work of art deserving the greatest prominence—had heretofore been hidden in the relative gloom of the upper walls.

Since initial lighting in this area had also been via skylights, these were replaced with ¾-in. plywood panels, painted white. Then, a grid of 2-in. rigid conduit was supported by the building's structural framework and, finally, a series of 4-by-4-ft Wakefield Omego-Plex and 2-by-4-ft Beta-Plex lighting units were supported from this framework. With enameled-steel reflectors, arched acrylic-plastic bottom panels, and either six or four 40-watt standard warm-white rapid-start lamps in each fixture, a modern module appearance was created and footcandle intensities at floor level were boosted to 60.

Again proving the adage that "a good job is your best salesman", we were finally requested to floodlight the main entrance, then floodlight the entire front of the building, then place supplementary lighting along the inner edges of the front windows to illuminate draperies hung behind them.

For exterior lighting purposes, adjustable clusters of weatherproof lampholders, equipped with 150-watt PAR-38 lamps, color roundels and metal mesh guards, were placed at ground level at close intervals. And, to illuminate the window drapes, double rows of asymmetric fluorescent reflectors were placed as vertical coves along the inner side frames of each window so treated.

The revamped electrical distribution system behind this relighting project reflects credit upon our field superintendent, Henry Louttit, since the thick masonry walls created a major problem of routing, drilling and channelling. Since noise had to be minimized during this "business-as-usual" modernization period, this part of the work was performed mostly when the library was closed at night or over week-ends. Several thousand masonry anchors were installed as part of this installation, while the pulling of new wires through old conduits, replacing the old switchboard with a modern assembly of switchgear, and installing many new breaker-type lighting panels all added to the job's complexity and interest.

Upon completion of this relighting job, the library management received numerous congratulatory messages—both written and verbal—praising their civic contribution. The relighting also created renewed interest in library functions. People using the building's facilities have skyrocketed. And books in circulation have jumped noticeably.

In our opinion, this is a striking example of what *can* be accomplished through practical planning, constructive promotion, cooperation with the owners, considerable persistence, plus team-work with all other groups in the electrical industry.

WIDESPREAD ATTENTION is directed towards modern all-electric diner in Philadelphia where cooking, air conditioning, lighting and other services necessitate 600-amp 4160-volt primary. Deceptively large interior is due to structure's depth plus full basement containing transformer vault, switchgear, refrigeration and mechanical rooms, bake shop and office.

MODERN

BY Charles McHugh
Assistant Supervisor
Arnold Electric Company
Philadelphia, Pa.

FROM photo-beamed door and infrared food warmers to modern kitchen, lighting and air conditioning, Philadelphia's new Godfrey Diner on Broad Street is "all-electric". And, in an attractive public service area where cove lighting, transcribed music, conditioned air and smoke exhaust units contribute to dining pleasure, up to 150 customers may be served simultaneously.

Should these customers be electrically minded, they would also note radiant heated pass-through food cabinets in walls between service counters and kitchen, warm-air hand dryers in rest rooms, and a wide variety of small appliances plugged into polarized 115- and 230-volt receptacles at food-preparation centers, service islands and at the cashier's cage.

All of these electric facilities promote the "modern look" in this smart new stainless-steel diner, yet the full extent of electric utilization can be appreciated only by visiting the kitchen, basement-based food and meat preparation rooms, bake shop, walk-in refrigerators and frozen food storage areas.

In these areas, power is evident in large blocks, including 15.9- and 22-kw electric ranges, a 15-kw bake oven, 12-kw broilers and frying kettles, 6-kw griddles, a 5.9-kw hot food table, a 4.8-kw heater for a 1-hp dishwasher and several 4-kw warming cabinets, all operating at 220 volts. Then, at the 115-volt level, appliances rated above a kilowatt include toasters, coffee makers, roll warmers and the like. Air conditioning also adds to the overall electric load, with two 10-hp compressors, a 10-hp supply fan and 2-hp condenser fan in service. And additional motors may be noted for dumbwaiters, domestic and heating hot-water circulation, large bake-batter mixers, exhaust fans, water coolers, ice makers and potato peelers.

Aside from the cove-lighted dining section and other public areas, illumination is fundamentally functional, with fluorescent strips and industrial reflectors installed in the kitchen, food preparation and mechanical rooms for general illumination, vapor-proof incandescents in exhaust hoods above griddles, fryers, steam tables and similar hot areas, and with 500- and 1000-watt floods above parking areas.

Switching convenience and circuit protection for this compact and comprehensive installation is obtained through seven control centers; two of them being 400-amp, 220-volt, 3-phase, 4-wire power panels; and the remainder being either 200- or 100-amp, single-phase, 3-wire, 115/230-volt assemblies for controlling lights, small motors and appliance receptacles.

Power is received initially at 4160 volts, with underground cables in galvanized conduit terminating at a 600-amp, 7500-volt air circuit breaker having an IC of 50,000. This service is stepped directly to 240 volts for 3-phase power, with three 75-kva Askarel-cooled transformers used for this purpose. Then power is again transformed for 115/230-volt, single-phase use through three additional 37½-kva rack-mounted dry-type units. All transformers are single phase.

This all-electric diner indicates that power installations need not be large to be impressive or commendable, for this one-floor-and-basement structure measures less than 40-by-60 feet in plan. Yet it contains maximum service facilities, thanks to the compact application of power for cooking and baking, food preparation and dishwashing, heating and air conditioning.

STREAMLINED KITCHEN is equipped with 220-volt electric ranges, broilers, frying kettles, griddles, hot food table, warming cabinets, dishwasher and numerous other facilities. Infrared pass-through service shelf, polarized waterproof receptacles, motorized dumbwaiter and photocell-operated door also promote convenience and efficiency. Lighting combines fluorescents with vapor-proof incandescents in exhaust hoods.

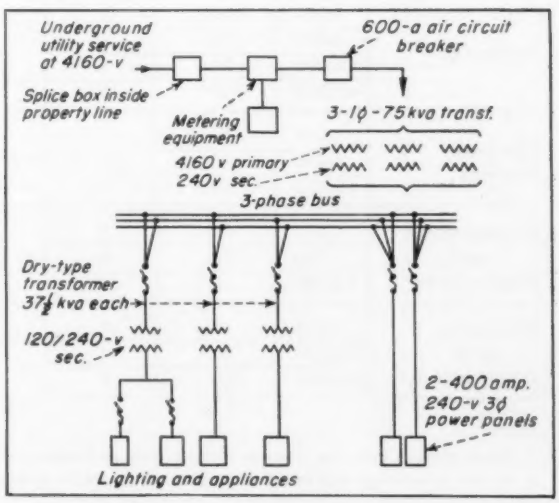
Power for cooking and baking, food preparation and dishwashing, air conditioning and lighting pays dividends in improved convenience, cleanliness and economy. Service is underground at 4160 volts through 600-amp breaker.

DINER GOES ALL-ELECTRIC

BREAD AND PASTRY are baked in diner's 220-volt 15-kw oven, where even heat and exact control insure quality uniformity. Batter for baked goods is blended in 5-hp mixer. Air conditioning for 40-by-60-ft building has rating above 30 hp.

INCOMING SERVICE at 4160 volts is initially stepped to 3-phase 240-volt power by means of three single-phase 75-kva transformers located in basement vault. Single-phase power is provided by three 37½-kva dry-type units.

SEVEN BREAKERS in transformer vault include two 400-amp 240-volt 3-pole, and five 200- or 100-amp 115/230-volt 2-pole switches. Large wiring gutters, consistent use of RH wire, color-colding and circuit identification are also featured.



UNDERGROUND SERVICE via cables in galvanized conduit passes through 600-amp 4160-volt air circuit breaker, then is transformed for power and lighting utilization by six single-phase transformers arranged as here indicated.

What the electrical man should know about . . .

SOUND SYSTEMS—Part II

Covering amplifier assemblies and sound-source devices such as microphones, record and tape players, radio tuners, and tone generators.

By Mortimer S. Sumberg, *David Bogen Co., Inc., New York, N. Y.,*
and J. F. McPartland

FIG. 8 — TYPICAL SYSTEM DATA FOR VARIOUS APPLICATIONS

Application	Sq. Ft. Area	Amplifier Rating (Watts)	Number of Speakers	Type of Speakers
Auditoriums	2,000	15	2	12" Cone in Wall Baffles
	5,000	30	2	12" Cone in Wall Baffles or
	15,000	50	4	12" Projector Horns
Ballrooms	2,000	15	4	12" Cone in Wall Baffles
	4,000	30	4	
	10,000	50	6	
Churches	1,000	10	2	10" Cone in Wall Baffles
	4,000	15	2	12" Cone in Wall Baffles
	15,000	30	4	
Classrooms, Offices and Stores	500	10	1	8" Cone in Wall Baffle
	2,000	15	2	10" Cone in Wall Baffles
	8,000	30	4	
Factories	1,000	15	2	12" Projector Horns
	4,000	30	4	
	8,000	50	4	Re-Entrant Horns
	40,000	100	10	
Funeral Parlors	1,000	10	1	12" Cone in Wall Baffles
	4,000	15	4	
	10,000	30	8	
Restaurants and Night Clubs	1,000	15	2	12" Projector Horns
	5,000	30	6	
	10,000	50	12	
Stadiums and Gymnasiums	3,000	15	2	12" Cone in Wall Baffles
	10,000	30	4	Re-Entrant Horns
	50,000	100	8	

NOTES:

1. Values given in table are averages—not minimums or maximums.
2. Number of speakers and amplifier power rating should be increased where background noise is higher than normal for the type of area.
3. Although wall baffles are indicated for cone speakers, ceiling-recessed or suspended baffles are frequently advantageous.
4. Acoustically "live" areas generally require lower speaker sound levels.
5. Number of speakers will vary with shape of the plan view of the area.

AS EXPLAINED briefly in Part I, every paging and music distribution system must include an amplifier assembly. From the standpoint of operation, this assembly consists of two parts:

1. The preamplifier—which compensates for the low level and other characteristics of the input signal as it comes from the microphone, phonomechanism or other input device. Where required, the preamplifier also provides suitable intermixing of several signals which will be fed to the power or booster amplifier (e.g., several microphones feeding through one amplifier assembly). The preamplifier also incorporates the controls by means of which the operator may adjust both the volume and the tone of the sound output from the system loudspeakers.

2. The power or booster amplifier—which takes its signal from the preamplifier and raises it to a power level sufficient to drive a loudspeaker or group of loudspeakers.

By far the largest number of sound systems employ amplification units which combine the preamplifier and power amplifier on the same chassis as a complete unit. Complete amplifiers of this type are available from several manufacturers with output running as high as 50 watts. This complete chassis will provide a variety of volume control knobs, tone control knobs, as well as the necessary microphone and phono input connectors and loudspeaker output terminals. In large sound systems running to 100 watts or more, separate preamplifier and power amplifiers are usually employed for greater flexibility. In installations of the latter type, one or more preamplifiers may be employed to drive one or more booster amplifiers, and it is not

FIG. 9—UNIT AMPLIFIER assembly combines preamplifier, power amplifier and controls on one chassis. A 3-speed phono player is mounted on top of the housing. To use, microphones and speakers are connected to proper terminals and the power cord is plugged into a 120-vac receptacle. This is a 30-watt amplifier.

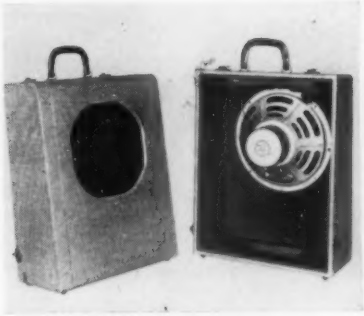


FIG. 10—CARRYING CASE for a portable sound system consists of two case-halves which can be clamped together to hold portable amplifier and microphone. Each half of the case contains a loudspeaker with a stiff protective grill across the front of the speaker on the outside of the case. Each case-half serves as a baffle.

FIG. 11—REMOTE CONTROLLER is a small, wall-mounting unit which connects to amplifier up to 2000 ft away and provides control of volume of two microphone channels. An amplifier must be designed to operate with this accessory. Not every amplifier will accommodate use of a remote controller.

uncommon to find large complex systems where a dozen or more booster amplifiers are connected to the output of a single preamplifier. It is the common practice in these large installations to mount the preamplifier and booster amplifier chassis in consoles or vertical cabinet racks, and to add in these housings several program devices such as a record player, tape recorder, radio tuner and a tone generator. Unless otherwise stated, however, when a sound man refers to an amplifier he usually means the single-chassis unit combining the preamplifier and the power amplifier.

Packaged amplifiers for sound systems are available in many sizes and types, with features designed to satisfy the requirements of virtually all applications. Where higher output power or the requirement for special features dictates the need for a custom assembled vertical cabinet rack or console incorporating preamplifier, several power amplifiers and various program input devices, it should be recognized that a considerable amount of engineering talent and assembly know-how is called for and that an experienced sound specialist should be consulted. Most of the leading amplifier manufacturers provide engineering and assembly facilities in their factories and encourage inquiries along these lines. At least one large manufacturer employs a Custom Division at the factory to engineer complex assemblies of any size, and makes this service readily available to its sound distributors through whom the electrical contractor may work.

In considering the selection of the proper amplifier for a given installation, many factors must be carefully considered. Among the most important of these are the following:

1. **Power output required.**
2. **Number and types of inputs (e.g., microphone, phono).**
3. **Output impedance values.**
4. **Special functions.**
5. **Source of power (e.g., 115 vac or battery).**
6. **Mounting of amplifier assembly.**
7. **Cost.**

Each of the above selection factors will be discussed below in detail. Since several of these aspects are inter-related, it follows that there will be some overlap in the details to be considered.

Power Output: To determine the amount of output power which the amplifier will have to provide, consideration must be given to the number of loudspeakers in the system and the wattage level at which each loudspeaker will be operated. If an installation requires the use of ten loudspeakers—each providing approximately three watts of power—it follows that an amplifier with an output rating of 30 watts is indicated. In conducting a survey of the installation site, it is frequently difficult to determine the exact number of loudspeakers which will be required and/or the sound level to which each speaker will be driven. Further, it may appear possible that at some later date additional loudspeakers will be added to cover areas not serviced in the original installation. As a precaution, therefore, it is the usual practice to select an amplifier with an output rating which exceeds the apparent system load requirement. In the above example, for instance, it would probably be a good idea to select a 50-watt amplifier in place of the 30-watt unit which would satisfy the initial requirements. The slight difference in amplifier cost is more than offset by the fact that increased flexibility is provided for future demands. In all of the foregoing, we have been concerning ourselves with maximum output power required, and it should be clearly understood that the adjustable volume control on the amplifier will enable the installer to set up the sound system so that the loudspeakers will be driven to any lower sound level. With the volume control at maximum, of course, the amplifier will provide only its maximum rated output, and this figure cannot be exceeded by any adjustment.

In most of the smaller installations, it is a relatively simple matter to determine the number of loudspeakers and the sound levels to which each will be driven. Larger installations do, however, require experience and/or test setups. A typical test setup might consist of a 10- or 15-watt amplifier brought to the installation site and connected to a loudspeaker which is temporarily mounted at the top of a ladder. The amplifier volume control is then advanced until the speaker appears to be providing the desired sound level for its particular area. By means of a meter and simple calculations, the sound level in watts for the speaker can be computed, and the levels to which the other speakers in the installation will be driven can be decided upon. As a rule, however, experience will usually enable the sound system installer to decide where speakers are required and how much power must be fed into each. To provide some idea of the total power required in typical installations, data are listed in Fig. 8. The values given represent averages and are not particularly critical. Where questions arise regarding ratings, it is advisable to

resolve these in favor of the higher value—bearing in mind that the amplifier volume control (or one of the several speaker line-matching transformer primary taps) may be used to achieve the desired sound level.

Complete amplification units incorporating a preamplifier and the power amplifier on a single chassis are readily available with the following output ratings: 10, 15, 30, 50 watts. Separate booster amplifiers are usually rated at 30, 50, 70, 100, 125 or 250 watts. Where large amounts of output power are called for, any number of booster amplifiers may be incorporated in a single sound system and driven from the preamplifier.

Number and Types of Inputs: Standard "packaged" amplifiers are available for systems requiring from one to five microphones and a phono mechanism or radio tuner. In one manufacturer's line of equipment, it was found that a 10-watt amplifier provided one microphone and one phono input; a 15-watt amplifier provided two microphone inputs and one phono input; 30-watt amplifiers were available with one or three microphone inputs, plus one phono input; a deluxe 30-watt amplifier featured four microphone inputs and one phono input. Rounding out the packaged line were two 50-watt amplifiers, the lower priced unit with two microphone inputs and one phono input—the deluxe version with four microphone inputs and one phono input.

The number of microphones required for a given installation can be determined after carefully checking with the purchaser as to the exact features which he desires. In most cases this is a relatively simple matter. For instance, a barker in a circus midway requires only one microphone. Paging announcements which are to be made from two points in a store would obviously require two microphones.

FIG. 12—MOBILE AMPLIFIER has an output power of 6 watts, operates from a 6-vdc source and is contained in a housing approx. 4 in. by 7 in. by 8 in. Power cable can be connected to auto or boat storage battery. Unit has microphone input terminal, a volume control, a speaker output receptacle and is designed for standby operation.

When the length of microphone cable does not exceed 50 ft, a high impedance microphone may be used. On the other hand, if the microphone cable must be run to lengths exceeding 50 ft, it is necessary to employ a low impedance microphone with low impedance microphone cable, and to convert the amplifier input to accept the low impedance signal. Conversion from high to low impedance input is a relatively simple matter with several amplifier lines and consists simply of removing a shorting plug from the top of the amplifier chassis and substituting for it a plug-in transformer. This technique permits the microphone channel to be reconverted from low to high impedance at any later date. It also affords considerable flexibility in that a four-microphone-channel amplifier may be set up to work, for instance, with two high impedance and two low impedance microphones.

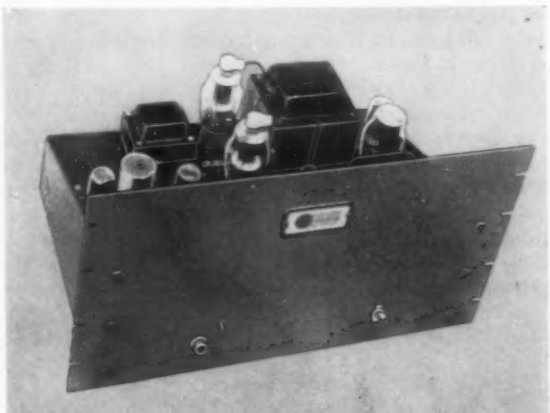
The phono input on most amplifiers requires a signal of much higher level than that provided by a microphone and is intended for use with a radio tuner, phono mechanism such as an automatic record changer, or tape recorder.

In more complex installations requiring the simultaneous use of more than five microphones, standard practice calls for the selection of separate preamplifiers and one or more power amplifiers—the several chassis being suitably mounted in a vertical cabinet rack or console.

Output Impedance Values: As explained in detail in Part I, the output impedance of the amplifier must be closely matched to the impedance of the speaker load if the rated output power of the amplifier is to be realized. The important aspects of this impedance matching problem were carefully considered in the earlier article and, therefore, require little additional attention at this point. Since almost all p.a. amplifiers provide a relatively wide selection of output impedance taps, there is little to differentiate between the small 10-watt and the large 50-watt amplifier. So-called high fidelity amplifiers—designed specifically for home radio/phono music systems—frequently offer only 8- and 16-ohm output taps which might be inadequate for a commercial sound installation requiring the use of speaker line-matching transformers.

As noted in the specifications reprinted from one manufacturer's catalog, the output impedance values which are available to the installer considerably simplify the impedance matching problem, since almost certainly one of these values will be found correct for maximum transfer of energy from the amplifier to the loudspeakers. Output impedance taps of

FIG. 13—TYPICAL 100-WATT BOOSTER AMPLIFIER is shown here in the two versions referred to in the text. On the left, the amplifier is shown with its protective cage, as it is used on a shelf or table and connected to a nearby or remote preamplifier. On the right, the same amplifier is shown mounted on a standard 19-in. panel for installation in a cabinet rack assembly.



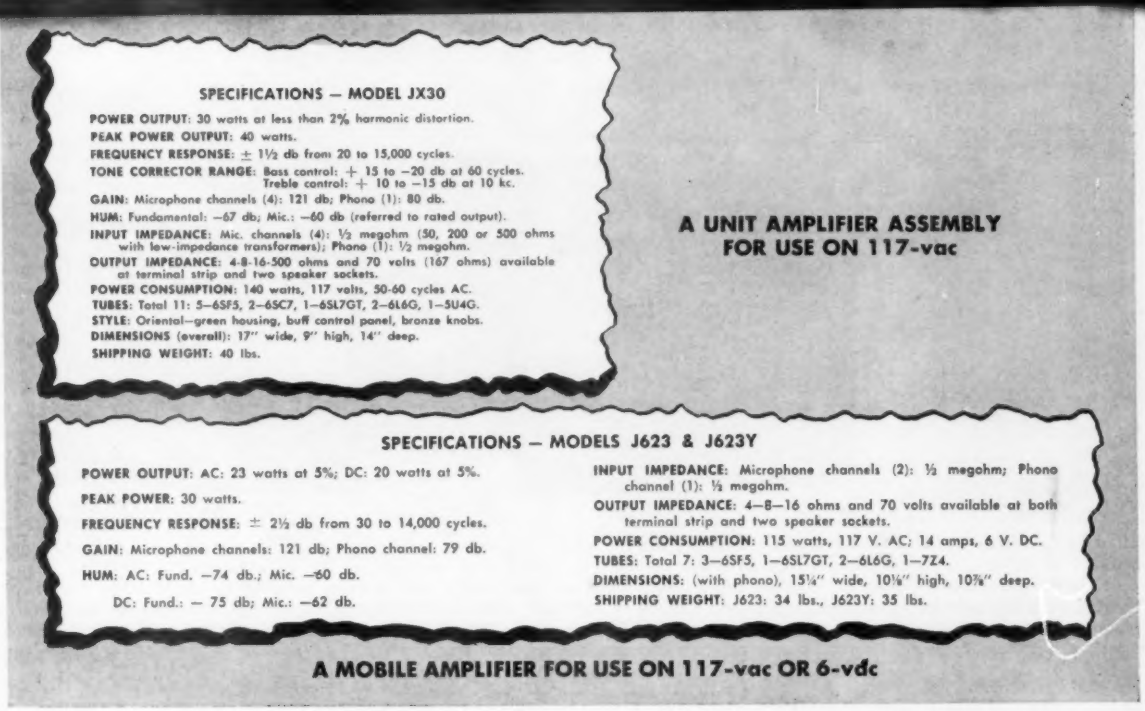


FIG. 14—Amplifier Specs in Catalog Form

4, 8, and 16 ohms are frequently used where the speaker lines are relatively short and the number of loudspeakers small enough to permit series, parallel or series/parallel connections. When a large number of loudspeakers are used with line-matching transformers, the constant voltage amplifier tap and constant voltage line-matching transformers should be used to avoid the need for complicated computations.

Special Functions: Depending upon the application, there are several special characteristics and functions which may be desired in an amplifier. Typical of these are:

a. *Phono-Top*—In many cases, particularly in mobile and portable applications, an amplifier must be equipped with a built-in phono turntable and tone arm (see Fig. 9). A wide range of standard packaged amplifiers are available with phono tops which will permit using 33⅓, 45 and 78 rpm records up to 12-in. in dia.

b. *Portable System*—Special carrying cases are constructed by amplifier manufacturers to house a complete portable sound system (see Fig. 10) consisting of a microphone with cable and connector, two loudspeakers each with 25 ft of cable and connector, and a 30-watt or smaller amplifier. To use, the two halves of the portable carrying case are unlatched and the amplifier and microphone removed. Each half of the case with its speaker is placed in position to provide the desired distribution of sound, and the speaker and microphone cables are then simply connected to the amplifier. After the amplifier has been plugged in to a source of 115-volt ac, the system is ready for operation. In selecting an amplifier to make up a portable system, consideration must be given to the availability of a suitable carrying case of the proper dimensions. Obviously, the amplifier weight is also an important factor.

c. *Controls* — Depending upon the nature of the installation, an amplifier may be required to have control flexibility over and above volume adjustment for the individual input channels. If music reproduction is a major function of the system and high quality of reproduction is important, separate bass and treble tone controls are essential to provide both boost and attenuation at both the high and low frequency ends of the audio spectrum. It will be found on examination of amplifier specifications that many units provide only reduction of high and low frequency sound, and do not permit boost. The increased flexibility in tone controls should be considered if the loudspeakers are of very high quality or if reverberation and acoustic feedback problems are encountered. Acoustic feedback (squealing) results when sound from the loudspeakers is introduced into the microphone. This problem can be very severe in many indoor installations, but can be remedied in many cases by the use of an anti-feedback control incorporated in some amplifiers.

d. *Remote Volume Control* — In many sound system installations (i.e., church, theatre, auditorium), it is desirable to control the volume of the sound output at some distance from the amplifier. To satisfy this special requirement, some amplifiers can be equipped with remote volume controllers (see Fig. 11) which permit an operator to adjust the overall volume of the microphone and/or phono input channels from a distance as great as 2,000 ft. from the amplifier. In a typical church installation, for instance, it is standard practice to conceal the amplifier, but to bring out a remote volume controller to the rear of the church where the sound level may be adjusted quickly and without distraction to the congregation.

e. *Standby Operation* — Frequently, sound systems used primarily for paging are operated only briefly and intermittently, yet the amplifier power must be applied at all times for immediate use. To considerably reduce the consumption of electric power during those periods when the amplifier is not actually in use and to increase the life of the tubes, some amplifiers are designed to accept a plug-in standby controller relay. This device is energized by a pushbutton in the base of the microphone stand and places the amplifier in an operating condition only for the brief interval during which a paging announcement is made. When the pushbutton is released, the controller relay becomes de-energized and the amplifier is placed in a standby condition—drawing less power.

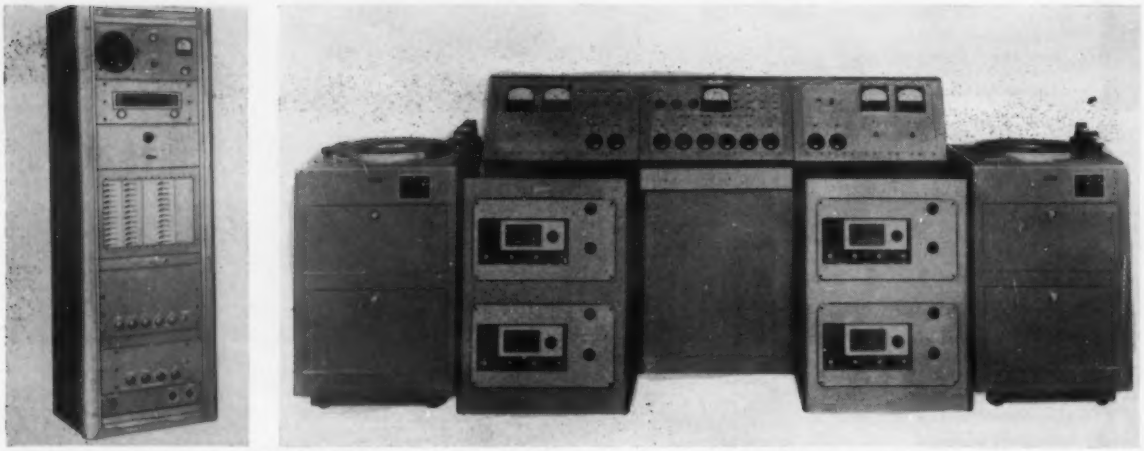


FIG. 15—CABINET RACK AND CONSOLE assemblies can be factory-engineered and built to meet the requirements of any sound installation. At left, a typical cabinet rack assembly contains its components mounted on 19-in. wide panels, including (from top to bottom) a monitor panel, an AM/FM radio tuner, input selector switch, area selector switches for distributing output, a 50-watt amplifier unit for music and paging and a 10-watt amplifier unit for intercom. At right, a very elaborate, completely custom-built console assembly for use in an overseas Air Force hospital consists of built-in preamps and booster amps, radio tuners, a high quality manual record player at each end and control panels at the top.

Source of Power: The characteristics of the available source of power for the amplifier must be considered. For instance, the requirement may be for a unit to be mounted in a car or bus where 115-vac is not available. Several mobile amplifiers specifically designed to operate on a 6-volt or 12-volt storage battery provide a choice in output ratings from 6 to 25 watts of power (see Fig. 12). In some areas only 115-volts dc or 115-volts ac, 25 cycles is available for powering the amplifier.

Mounting of Amplifier Assembly: Most packaged amplifiers are furnished with a protective cage so that the equipment may be safely installed on a shelf or table. When the amplifier is to be mounted in a cabinet rack of standard design, it may be purchased without the cage and with the chassis securely attached to a heavy gage front panel of standard width (See Fig. 13). The latter is properly marked to identify all controls and is notched at both ends so that the entire assembly may be easily installed in the cabinet rack. In mobile installations it is frequently found desirable (especially where a phono top is employed) to attach the amplifier to a spring-loaded base which some manufacturers provide for their equipment. This shock-mounting base is usually desirable even in indoor installations where the amplifier is subjected to a considerable amount of vibration or shock. If the amplifier shown in Fig. 9 were used for square dancing without a shock-mounting base, it would be found that the stylus (needle) in the tone arm would frequently jump out of the record grooves when the activity on the dance floor reached its peak.

Cost: In selecting an amplifier for any sound system, cost is not so important a factor as it might seem at first glance. Usually the difference in price between the least expensive amplifier which will do the job and a much higher quality unit is relatively small when considered in relation to the overall outlay for the complete sound system. As with all other commodities, the amplifier cost reflects the quality of the components, the number of features provided, the overall performance and the degree of quality control exercised by the manufacturer. Obviously, a 30-watt amplifier with four microphone input channels costs considerably more than a similarly rated unit with only one microphone channel. If only one microphone is to be used in the system, the cheaper unit is indicated. A few manufacturers of amplifier equipment offer deluxe as well as economy priced lines. In some instances, there is no sacrifice of reliability in the economy line, but the features are more limited and the overall performance somewhat below that of the deluxe line. Reliable manufacturers provide complete sets of data for all amplifier models which enable the purchaser to make intelligent comparisons to determine whether the lower priced unit will be adequate. Obviously, an amplifier should be selected only for its ability to fulfill a certain set of requirements (see Fig. 14). To purchase an amplifier with capabilities far above the requirements of the particular job is uneconomical. Typical factors which affect the cost of amplifiers are as follows:

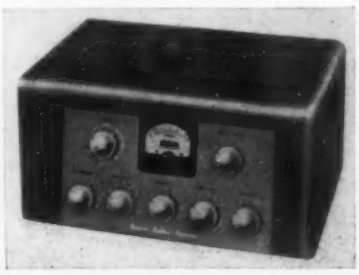


FIG. 16 — PORTABLE PREAMPLIFIER can be connected to one or more remotely located booster amplifiers or can be connected by telephone line to a radio broadcast station. This unit has four microphone input channels, one input for phono or radio tuner, volume control for each input channel, a master volume control, a tone control and a level meter.

A. Power—Higher power amplifiers cost more because larger transformers and huskier components must be employed.

B. Frequency Response—If an amplifier is to have a very wide frequency response (i.e., equal amplification of all sounds from very low bass to very high treble) for high fidelity reproduction of music, its design calls for very careful and sometimes elaborate circuitry, a very costly output transformer and frequently more expensive components. It is important to bear in mind that if the installation budget calls for a cheap loudspeaker which will handle frequencies from 100 to 7500 cps, there is little reason for selecting an amplifier of very wide

response which can, for instance, handle frequencies from 20 to 20,000 cycles. An amplifier which more closely approximates the frequency response of the loudspeaker should be selected if cost is important.

C. Distortion—This is expressed as a percentage and may be considered as undesired difference between the input and output signals. As a general rule, the amplifier price increases as the distortion figure decreases. Typical good p.a. amplifiers designed for commercial installations are rated at approximately 5% distortion (for full amplifier output). Some deluxe p.a. amplifiers are rated as low as 2%. It is interesting to note that the best of the home high fidelity amplifiers designed for use with extremely expensive loudspeakers carry ratings as low as .1%. In a manufacturer's catalog, it will be found that the distortion percentage is usually indicated for full amplifier power output. The distortion decreases as the output is reduced from full power.

D. Enclosure—Aside from esthetic considerations, some installations require extremely heavy outer cabinets as protection against damage to the unit and injury to personnel. An amplifier designed for military use would have to withstand considerably rougher handling than would be accorded the average commercial equivalent. A functional design is favored by most amplifier manufacturers today, leaving little difference in enclosures among the more important lines.

Reference has been made earlier to complex amplifier assemblies which are housed in vertical cabinet racks or consoles and which employ preamplifiers, booster amplifiers, and one or more program devices such as record player, tuner, etc (see Fig. 15). In some installations, however, instead of mounting the preamplifier and booster amplifiers in a single custom cabinet, we frequently find the need for storing the preamplifier in one location and remotely housing the several booster or power amplifiers. A typical installation of the latter type is used for night club broadcasts where a small remote preamplifier (see Fig. 16) is installed only with microphone in the night club —the output feeding over a telephone line to the broadcast station. In some large installations, it has been found desirable to install the preamplifier and program devices in the main building, with one or more booster amplifiers installed in outlying buildings for driving speakers in their immediate vicinity. The considerations for these installations are somewhat beyond the scope of this article, but it should be noted that the elements of a sound system may be widely dispersed.

Program Sources

The input signal to an amplifier in a sound system may originate from one or more sources as was described at some length in Part I. A description of the operation and application of the most important of these several program devices will be found in the following paragraphs.

1. *Microphones:* Stated in the simplest possible terms, a microphone is a device which transforms sound waves into electrical energy. Since the effective reproduction of speech and music by the sound system depends to a considerable extent upon the microphone selected, it is important that there be a clear understanding of the many microphone types which are available, and of the general characteristics of each. Microphones may be classified according to their sensitivity pattern, the impedance of their outputs (high or low), principle of operation (crystal, dynamic or velocity).

Sensitivity Pattern — Microphones are sometimes classified as uni-directional, bi-directional, and omni-directional. These characteristics can be of tremendous importance and may be the deciding factor in whether the system works properly or not. A uni-directional microphone is sensitive to sound coming from one direction and is selected frequently for stage and auditorium work. The cardioid microphone (see Fig. 17) enjoys tremendous popularity as a uni-directional microphone because in night clubs and theatre work it rejects noise coming from the audience and provides pick-up primarily from the performer or speaker. Its use is also dictated when acoustic feedback is a serious problem. The bi-directional microphone will accept sound from both the front and back and is, therefore, a logical choice for interviews, dialogue work, etc. The omni-directional microphone does not discriminate against sound from any direction and is widely employed for group pickup, round-table discussions, etc.

Output Impedance (High or Low) — A high-impedance microphone (which could be a crystal or dynamic type) must be operated within 50 ft of the amplifier since the higher frequencies are attenuated considerably as the distance between the micro-

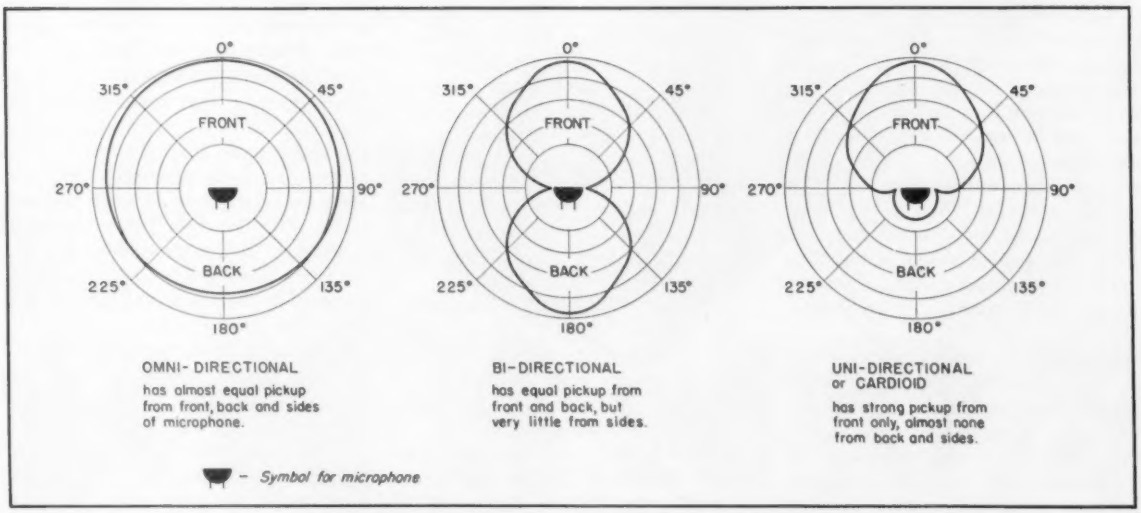


FIG. 17—Pickup Directivity of Microphones

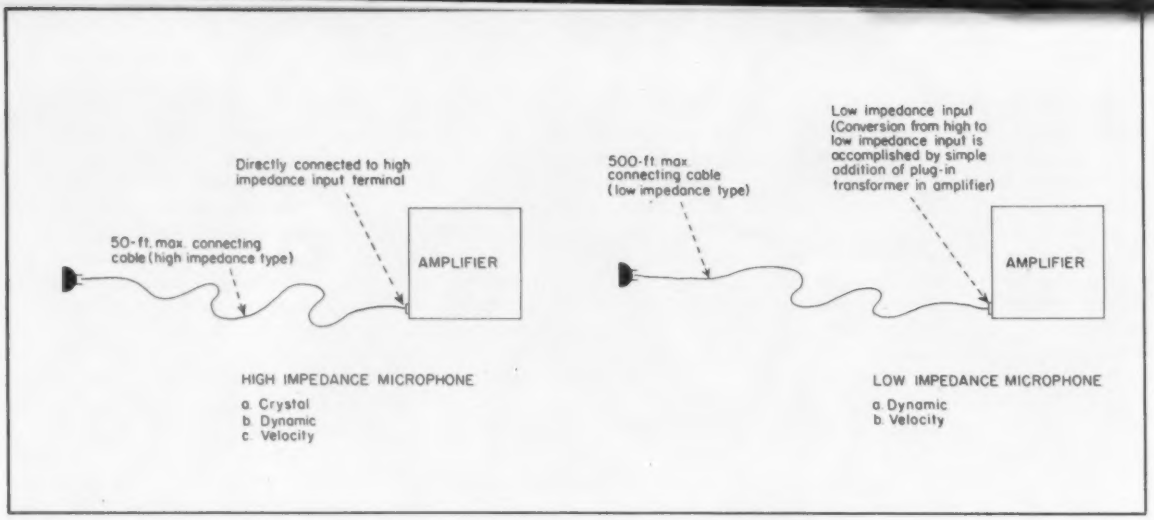


FIG. 18—Connecting Microphones To Amplifier

phone and the amplifier is increased. Equally important is the fact that high impedance microphone lines will pick up hum and noise from nearby power devices, appliances and their associated power lines. If the distance between the microphone and the amplifier must be greater than 50 ft, a low impedance microphone, low impedance microphone cable and suitable amplifier should be employed (see Fig. 18). Low impedance microphones may be operated over lines well in excess of 500 ft without attenuation of high frequencies or serious loss of signal level; the danger of hum and noise pickup from adjacent appliances and power lines is considerably reduced.

Microphone Types—When classified according to the fundamental principle of operation, we find three basic types of microphones: carbon, crystal, and dynamic. The carbon microphone is almost never used in commercial sound systems and should be rejected as a possible choice.

The crystal microphone is always a high impedance type, very economical and capable of excellent performance. The structure of the crystal microphone interior is such that its application must be confined to places where temperatures are below 125 deg F., to prevent excessive heat from damaging the elements and thereby rendering the instrument inoperative. It is obvious that a microphone of this type would not be a wise choice for outdoor use in mid-Summer, in boiler rooms, etc.

The dynamic microphone is constructed somewhat like a miniature dynamic loudspeaker and actually operates on the same moving coil principle. Because of such factors as its ruggedness, wide frequency response, moderate price and availability with either high or low impedance output, it is probably the most popular type in use today for commercial sound systems. Some high impedance dynamic microphones are assembled with a small switch at the rear of the instrument which permits the installer to select high or low impedance output as desired.

Other Types—Infrequently the requirement for the highest possible quality will indicate the use of a velocity or ribbon microphone which is used most often in broadcast studio work. This type of microphone is more fragile than the dynamic, is not recommended for outdoor use and usually is the most expensive instrument in the manufacturer's line.

Recapitulation—For indoor use at voice frequencies where the microphone is to be located relatively close to the amplifier, the crystal microphone is an excellent choice. For outdoor use, for pickup at points greater than 50 ft from the amplifier or in locations where the ambient temperature runs well over 100 deg F., the dynamic microphone (low impedance) should be selected. Where feedback or audience background noise presents problems, the cardioid microphone should be given top consideration. If it is essential that the microphone be placed at a considerable distance from the performer or announcer, it will be found that the uni-directional microphone will work out much better than will the omni-directional type.

2. *Phono and Tape Mechanisms:* The automatic record changer and manual phono player have been in common use for many years and require little comment here. Since the advent of the microgroove record, it has been possible with the automatic record changer to provide a program of music distribution throughout a factory which runs to several hours without requiring attention. The manual record player is capable of better performance but requires frequent record changing. Tape playback mechanisms are available today with specially prepared tapes to provide suitable musical programming for periods up to eight hours. By incorporating this mechanism in a sound system, it is possible to distribute a carefully selected musical program throughout a factory for an entire day without adjustments of any kind.

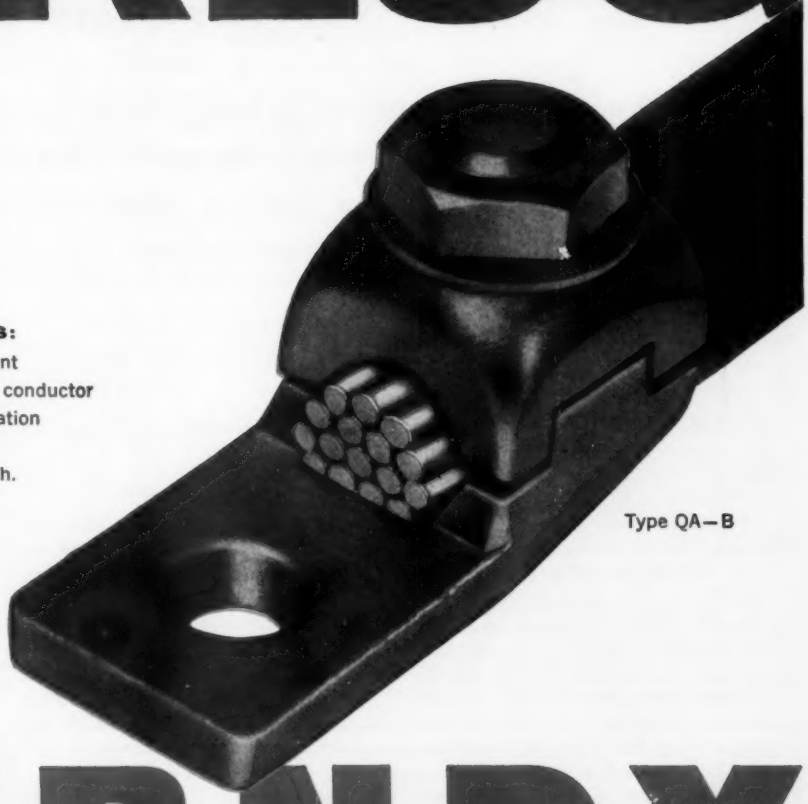
3. *Radio Tuners:* These differ from AM and AM/FM radios in that the audio amplifier section and loudspeaker have been omitted. The radio tuner permits selection of broadcast programs which may be introduced into the amplifier through the phono tuner input described earlier in this article.

4. *Tone Generators:* It has become almost standard practice in the past few years to include a tone signal generator in the larger console and vertical cabinet rack assemblies which are to be installed in factories. A typical tone oscillator of this type may be easily connected to the time clock in the factory so that a steady tone of short duration will be distributed to the loudspeakers throughout the entire factory at regular intervals to indicate start and termination of lunch periods, work shifts, etc. In more elaborate systems, it is not unusual to find an electronic siren which can be triggered not only at the amplifier assembly but also from remote points in the building to indicate the presence of fire. In one highly specialized type of church sound system, a small built-in device simulates the tone of a multiton bell and can hardly be distinguished from a cast bell when heard at some distance from reflex trumpets in the church belfry.

"Quick, all right,-all I need is a wrench..."

"...and it's cast to outlast the conductor!"

QIKLUG



Know your Burndy QIKLUGS:
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Installed with an ordinary wrench.
Saves time and labor costs.

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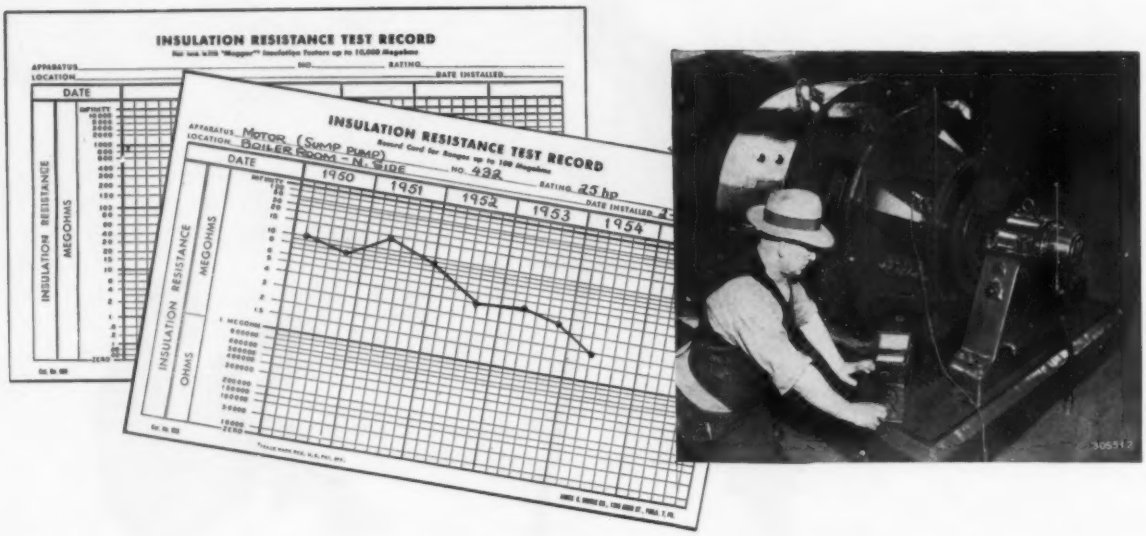

INSULATION RESISTANCE

. . . Its Measurement and Meaning

What makes good insulation go bad? How can you check it before it breaks down? How does an insulation tester work? What testing procedures should be practiced? How do you interpret meter readings? Is periodic testing worth the effort? Here are your answers.

Ralph E. Valentine, *Supervising Engineer*
The Ocean Accident and Guarantee Corporation, Limited

EVERY wiring medium in any plant—and that includes circuits for motors, generators and transformers—has its electrical conductors carefully wrapped in insulation. Like a house that is insulated to keep heat from leaking out in winter, an electrical system is also insulated to keep electric current from leaking to ground or between conductors. As time goes by, however, insulation materials may weaken, eventually reaching a point where it suddenly fails altogether and you wind up with a grounded machine, curtailed production and a major repair bill. Yet a motor, generator, transformer or other apparatus rarely displays signs beforehand of its impending failure—unless you keep your finger on its "pulse." By so doing, you can become aware of the points in your electrical system where insulation is starting to go bad *before* it actually breaks down.

What Causes Breakdown?

When a piece of new electrical equipment is delivered to a plant, its insulation is probably in excellent condition, and a resistance measurement taken at that time, especially if the machine is cold, should show a high reading. Assuming that the machine is installed properly and performs as it was designed to, why shouldn't the insulation resistance remain at a safe value?

Two of the basic reasons are: dirt and moisture. And, if no attempt, or only infrequent attempts are made to keep these accumulations removed, the operating life span of the equipment will be shortened considerably.

Dirt prevents necessary radiation of heat. This, together with the deteriorating effects due to interaction of acids, alkalis and oils present, will promote premature aging of the insulation. In turn, leakage paths will develop from conductor to conductor, or between conductor and frame. Even porcelain, mica and various phenolic materials are not good insulators unless they are kept clean and dry.

If dampness and dirt could be positively and permanently excluded from insulation, the problems of an operating man would be greatly simplified. But, practically, we know that these insulation enemies are ever present. So, for better or worse, we have to cope with them. Keeping them in check can be done only by practicing preventive maintenance, and the more serious the conditions, the greater the need for maintenance.

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THE TOOLS *Electricians* ask for!

EIGHT MODELS for all wire sizes from No. 8 to No. 26. Also for 300 ohm TV downlead wire, POSJ and non-metallic plastic sheathed cable, except Neoprene. Illustrated: "E-Z" Stripper for UF cable.

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"E-Z" Automatic WIRE STRIPPER

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RUGGED, ALL-STEEL FOR HEAVY DUTY STRIPPING

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V-notches that align blades with stripping holes prevent scoring or damaging wire.

Specially hardened precision-built blades are replaceable. Wire sizes are marked above stripping holes for quick identification. Cutter edges are shielded to protect hands.

IDEAL is your specialized source for quality electricians tools. See your Ideal distributor or send coupon for catalog information.

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Tools that Pay Off in FASTER WIRING

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Lubricates Wires for Faster, Easier Pulling . . . Protects Insulation.

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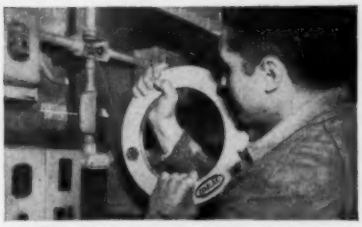

IDEAL **FISH TAPES, REELS AND PULLERS**

Saves Up to 50% in Fishing Time

The safe, easier way to handle long conduit runs. Reel gives big pulling power, keeps tape always under control, protects hands. Five sizes, 50 to 200 foot lengths.

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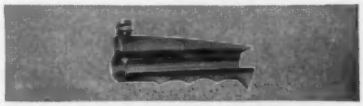

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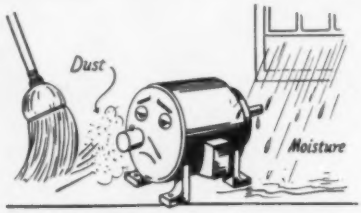
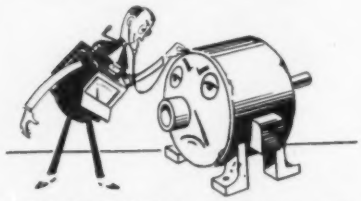
Insulation Resistance

. . . *Starts on page 90*

As sometimes happens, the decrease in insulation resistance may be sudden (for instance, when equipment is flooded)—but most usually the insulation resistance drops gradually until leakage currents burn through the insulation to ground. Therefore, there is ample time to detect the advance toward failure and to check the progress by making periodic resistance tests. The tests, by measuring the resistance to ground, also indicate in a general way the condition of the insulation between conductors.



TWO ENEMIES of insulation are dirt and moisture which, together with action of oils and acids present, can promote premature deterioration by forming gums, clogging ventilation paths, reducing radiation and causing internal heat.



PERIODIC TESTING with Megger, like that of a doctor's stethoscope, tracks down internal trouble before it develops into a serious breakdown. Tests end guesswork by indicating if the machine is clean, dry and safe for service.

Why Aren't Readings Consistent?

It does not take a slide-rule expert to apply an insulation resistance tester. All you have to do is connect one of the two test leads to the frame of the machine and the other to a terminal or ground of the machine or wiring you want to check. Then go ahead and simply turn the crank, reading the resistance of the insulation on the meter scale.

Because of its simplicity and accuracy, the Megger tester is a corking good instrument, but it isn't a substitute for common sense. In other words, the true condition of insulation can be obtained with the use of an insulation tester—provided the readings are interpreted correctly.

Check these features of SPANG® HD

HEAVY-DUTY HOT-DIPPED } GALVANIZED CONDUIT

...heavy-duty coating

SPANG HD (Heavy-Duty, Hot-Dipped) Galvanized Conduit is coated with prime western zinc plus an "insurance coating" of clear lacquer to produce the best heavy-duty finish on galvanized rigid conduit you can buy!

...high corrosion resistance

SPANG HD zinc coating is well in excess of the standard thickness of zinc required by Underwriters' Laboratories, Inc., and American Standards Association. This protection makes SPANG HD highly resistant to corrosion and white rust.

...uniform finish

SPANG HD is air-wiped as it is removed from the galvanizing tank to produce a smooth outside finish. Superheated steam blown through the interior of the conduit assures a sleek, uniform interior finish for easy wire pulling.

...strong bonding of finish

After air treatment, SPANG HD Galvanized Conduit is immediately quenched to prevent grain growth of the zinc coating. This assures a strong bonded finish that won't crack or peel under severest bending strains.

All this... and Quality-control, too!

Manufacturing factors such as controlled heat, controlled welding and controlled finishing produces in SPANG HD a strong conduit, easy to work with . . . makes it a top-quality conduit for top-quality installations. Try it on your next job!

Your local SPANG Distributor carries the complete SPANG line. Write to us for complete information and the name of your nearest SPANG Distributor.

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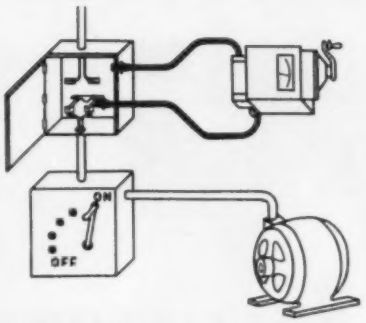
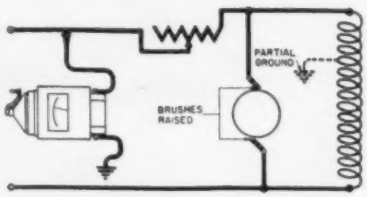


CONNECTION of meter requires no opening of splices or intricate arrangements. One lead is clamped to ground, the other is attached to the blade of the motor's open starting switch, then the crank is turned and a direct reading taken.



GROUNDS are clearly indicated by insulation tester and may be traced by progressively isolating various parts of the circuit, as indicated by this sketch of a dc motor hookup. Test procedure is both fast and simple.

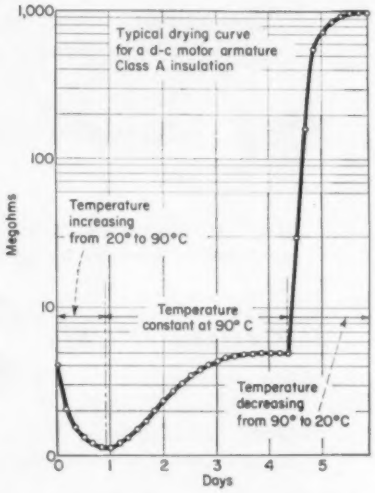
For example, a single machine could be tested three days in a row and the winding might show three different readings, depending upon whether the machine was hot or cold, wet or dry, and how humid the weather was. In fact, the resistance of good electrical insulation is pretty sure to be relatively high for a cold machine on a cold day, and lower when both the machine and the surrounding air are warm. The same holds true for humidity, on a dry day, you may find the resistance is higher than on a wet day.

This influence of temperature and humidity can be solved by using common sense, that is, noting the temperature of the machine beforehand and taking note of the weather in general. By knowing the surrounding conditions, then adjusting all readings to what they would be at a fixed temperature (such as 68 degrees F), you can obtain a true picture of insulation resistance.

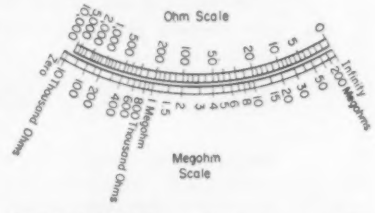
What is a Satisfactory Reading?

Many articles have been written, loaded with elaborate formulas, attempting to show just what a reading should be for good insulation. For general purposes, however, a good practical rule for an average plant operator to follow would be to draw a line at one megohm for all machines rated under 1000 volts. This rule applies for spot readings and, when insulation resistance drops below one megohm on such apparatus, you can begin to expect trouble. When a machine is rated over 1000 volts, however, just divide the voltage rating by a thousand to get the minimum value in megohms. Maintenance men refer to this rule as "one megohm per thousand volts."

Since we have already mentioned that single readings may vary under different conditions, it is important to take periodic insulation resistance measurements under similar conditions whenever possible, then record these readings on test record cards—a separate card for each piece of equip-



MEGOHM CURVE obtained by frequently testing insulation of a dc motor during a post-flood drying treatment shows that initial resistance dropped when armature was heated from 20 to 90 degrees C. Readings then started climbing.



DOUBLE SCALE and inclusion of a flip switch facilitates fast reading of resistance for, depending upon order of the resistance, maintenance man can check motor insulation in terms of either ohms or megohms.

ADV.

NEW PRODUCTS

Leviton "Quiet Switch" Assures Noiseless Action

For bedrooms, sickrooms, nurseries, libraries, hotels, hospitals and other places where "peace and quiet" are essential...the new Leviton QUIET SWITCH is just what is needed. A lifetime switch that is tops for quality, reasonable in price and modern in quiet action. Everyone will be switching to the new Leviton Quiet Switch...cash in on the big demand for electrical wiring modernization. Available in single pole, double pole and 3-way . . . in either brown or ivory phenolic. Rating 15A 120-277V AC only. Meets UL and CSA specifications.

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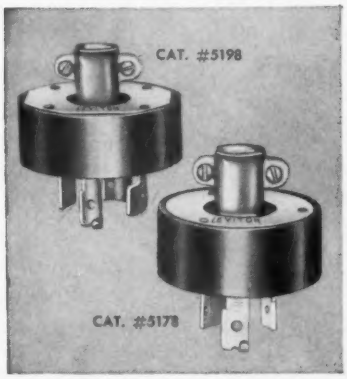

LEV-O-LOCK Rubber Caps afford *extra* protection against shock and breakage often encountered in industrial installations. Order type 5178 caps for 20 Amp., 3 wire, or type 5198 for 20 Amp., 4 wire. Sturdy construction features assure long life; latest design makes installations fast and easy. Other famous LEV-O-LOCK devices, in bakelite, listed by the Underwriters' Laboratories, are available in 2, 3 and 4 wire, 10 and 20 amp. caps, connectors and receptacles.

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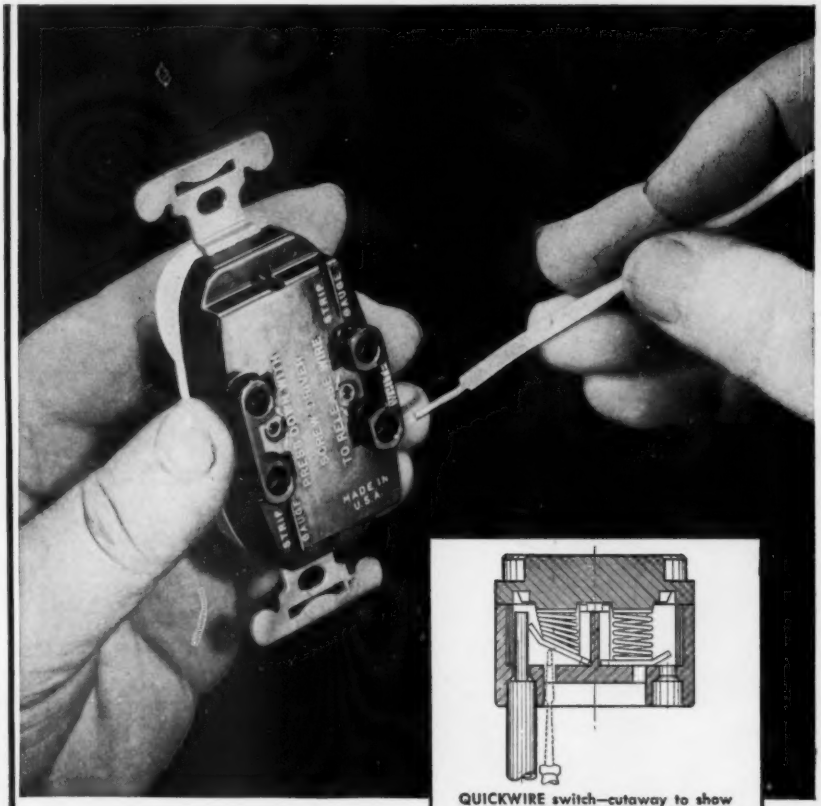

QUICKWIRE switch—cutaway to show Leviton's exclusive heavy coil spring pressure connector.

EASILY THE BEST!

— Quick and easy installations are done best with

NEW LEVITON Quickwire

spring type, screwless terminal switches and receptacles.

QUICK — because there are no wire loops to make, no screws to loosen and tighten. EASY — because you simply strip the wire and push it into hole. BEST — because Leviton's **exclusive** heavy coil spring connector holds the wire in place firmly, making permanent contact. To release, simply insert a screwdriver into the release hole.

You save time, money, labor costs when you use QUICKWIRE spring lock switches and receptacles. Simple, easy-to-read instructions are molded into the Bakelite on each device. Deeply recessed wire wells prevent exposure of bare wire. Fully enclosed housing, plaster ears, and handy strip gauge marking on each device.

QUICKWIRE receptacles are available in brown or ivory phenolic. Switches have either brown or ivory toggles and the same famous Leviton switch mechanism — known for service and dependability the world over. And both devices meet UL, CSA and Federal Specifications, of course.

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For Best Results Use Wire By AMERICAN INSULATED WIRE CORPORATION

Insulation Resistance

. . . *Starts on page 90*

ment. Over a period of months, or years, these readings will indicate a true trend of insulation condition, and a dip or lowering of the resistance curve will warn of trouble before it arrives.

Knowing that trouble is brewing, a machine can be taken out of service when it is convenient to do so or when it will not disrupt production (such as over a week-end, at night or during a vacation period) and, in many cases, after it is properly cleaned and dried out, a subsequent check will show whether or not insulation resistance is backed up where it should be.

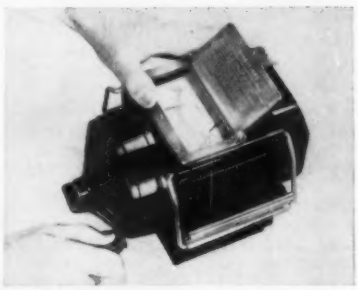
Testing is Simple

A good mechanic can inspect, clean and lubricate mechanical parts of a motor or other machines without the use of instruments. But resistance can only be checked with an insulation tester.

Tests with this instrument, however, are simple, involving no opening of splices or upsetting things in general (unless a ground is present). All you have to do is pull the machine's safety switch, hook one of the meter's leads to ground or machine frame, and the other lead to the switch blade for testing purposes.

If a motor starter is in the circuit between the switch and a motor, block it in the running or closed position before making the test. All that remains then is to turn the crank of the resistance tester, and read the scale. Testing time should not average more than a minute each—a minor expenditure in money and effort to keep tabs on the insulation.

In passing, it is interesting to note that a Megger insulation tester may be used for purposes other than test-



INSULATION TESTER is lightweight compact instrument that indicates exact insulation resistance on clear scale. Connecting two test leads between ground and wiring to be tested, then turning crank, is matter of minutes.

Roller-Smith

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UNI-BUS BUSWAY

A New Concept in busway systems that obsoletes all other methods of carrying current.

- Low Voltage Drop in ***PLUG-IN*** AND ***FEEDER*** TYPES.
- High Short Circuit Strength in ***PLUG-IN*** AND ***FEEDER*** TYPES.
- ***ONE FLEXIBLE FITTING*** makes elbows, offsets —simplifies engineering and eliminates costly delays.
- ***COMPLETE SAFETY*** because live bus bars at plug outlets and live connections in plugs are eliminated.

And All at Lower Cost!

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ELECTRICAL SWITCHGEAR
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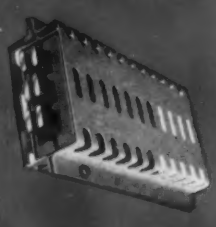


ECONOMY

New clip-on hanger and lighter weight busway mean less installation time. Feeder system often costs less than conduit and wire, yet is 100% reusable.

FLEXIBILITY

Flexible connector eliminates all special fittings so that a minimum number of components meet all job requirements. Plug-in and feeder systems interchangeable.

SAFETY

Interlocked safety slide over plug outlet cannot be opened until covered by plug. Interlocked cover and visible contacts in plug are positive assurance of safety.

Insulation Resistance

. . . Starts on page 90

ing insulation resistance, it may be used to determine the portion of the circuit in which a low reading exists. For example, if a dc motor keeps blowing fuses on starting, after making sure that the circuit is dead (checking with a tester or lamp), use the insulation resistance tester to find out if the motor circuit is grounded (or has very low resistance value).

How About Wet Equipment?

Due to occasional high tides, cloudbursts or floods from other causes, electrical equipment sometimes becomes submerged; soaked with fresh or salt water, clogged with silt or otherwise put out of action. The cleanup job is tough, requiring washing, blowing out with compressed air and drying before the units are again ready for service. Even a Megger reading is not always conclusive proof that a machine is safe to be returned to service and, in these instances, the value of past records of insulation resistance for a particular machine becomes high indeed.

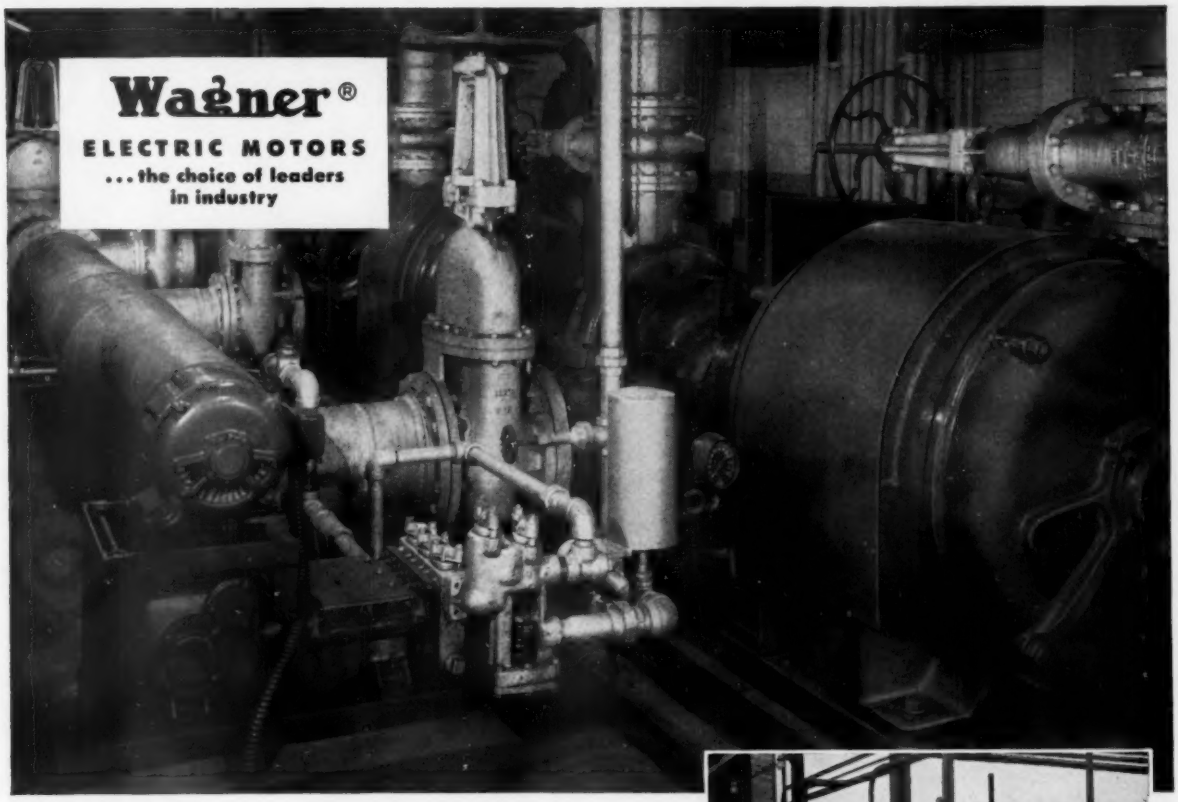
For example, a 1000-hp motor which has been submerged might show a Megger reading of 1.5 megohms after the cleanup has been completed. An offhand opinion would be that the motor was fit for continued service. Normal insulation resistance, however, might have ranged between 10 and 20 megohms prior to the flood and, if the records showed this to be the case, the reading of 1.5 megohms would be a sure indication that water was still in the windings.

Is It Worth the Effort?

Routine insulation resistance testing need not be a separate function of the electrical maintenance department, for tests may be made while checking control and starting equipment for rotating machines, or during routine cleaning and inspection of bushings or insulators of non-rotating apparatus.

It will soon be evident, however, that the expenditure in man-hours required to institute and maintain periodic electrical checking procedures will quickly be overbalanced by savings resulting from fewer failures, fewer emergency shut-downs, losses in production as well as greatly reduced maintenance and repair bills. Then some of the surplus man-power can be shifted from maintenance to other lines of productive activity.

Wagner Industrial Motors help continuity of operation at U. S. Steel's FAIRLESS WORKS



At U. S. Steel's giant Fairless Works, hundreds of Wagner motors drive fans, blowers, pumps, coal breakers and other vital equipment. Shown above are the 300 hp Wagner Type RP motors that operate gas washer pumps at Fairless.

This type of Wagner motor is built in ratings up to 400 horsepower. It is protected by a heavy steel frame with ventilating openings at the bottom only and by endplates of dripproof design. These motors have the winding strength required to stand the shock of starting heavy loads repeatedly and have adequate ventilation to operate continuously without exceeding their 40° C temperature rise.

A skilled Wagner engineer will be glad to help you select the correct motors for *your* specific application. Just call the nearest of our 32 branch offices, or write for Bulletin MU-185 for complete information.

A 60 hp, type CP-1 and two 100 horsepower, type EP-1 Wagner motors driving final cooler pumps in the coal chemical area at Fairless Works coke ovens.

Wagner Electric Corporation
6413 Plymouth Ave., St. Louis 14, Mo., U.S.A.

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

M55-17

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS–AIR AND HYDRAULIC

ANOTHER EXAMPLE OF Cope EFFICIENCY...

COPE 70,000 SERIES CABLE TROUGH WITH THE BUILT-IN COUPLER

now available in 12′ length

33% fewer connections

The new Cope 70,000 Series Cable Trough with the built-in Coupler is now available in 8, 10, and 12 foot lengths, and affords you 80% SAVINGS in assembly time, PLUS 33% FEWER CONNECTIONS.

These features alone mean real savings for you, in time and money.

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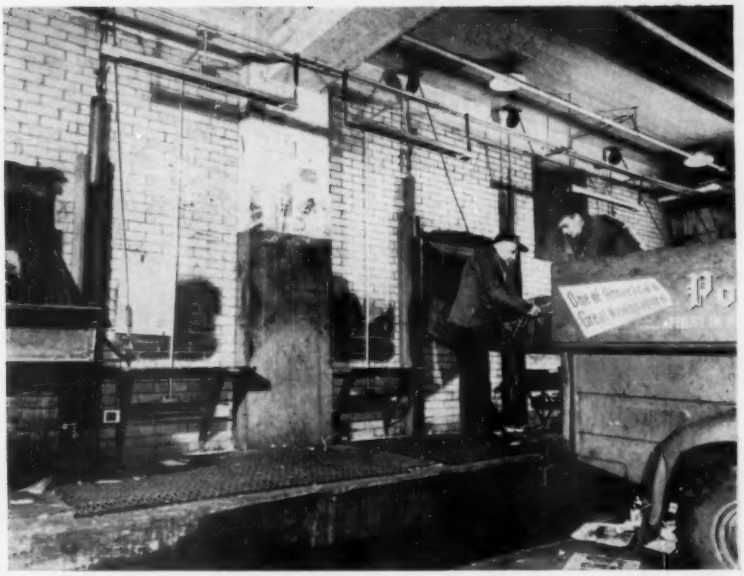
Practical Methods



ELECTRIC HEATERS mounted on newspaper loading platform provide protection against winter weather for loading operations.

Electric Heaters Warm Loading Platform

HEATING

Far-infrared electric radiant heaters on the loading platform of Pittsburgh's morning newspaper, The Post Gazette, are providing warmth during cold weather for the mailers and truck drivers working at the platform.

Overhead steam radiators, previously adequate to offset penetrating cold, proved incapable of neutralizing icy drafts sweeping in from the nearby Monangahela River when formerly protective adjacent buildings were removed to make way for a new highway.

Ten Chromalox heaters, adaptable to the newspaper plant's 208-volt system, were placed at strategic locations along the whole length of the platform. Five of the ten were positioned above five chutes which convey bundles of newspapers down to the loading platform and waiting trucks, while the remaining five, shielded by protective grilles, were placed horizontally along the lower portion of the platform wall for leg, ankle and foot comfort.

All units are individually operated from a control panel at one end of the platform. A safety switch in the basement provides simultaneous shutoff of all heaters.

Each heater contains an alloy-sheathed tubular heating element mounted in an extended aluminum housing. Brightly polished reflectors focus parallel rays of heat into continuous bands of warmth at each work station.

KO'd Straps Align Conduit Stubs

INSTALLATION

Conduit runs which have been turned up from the slab form to provide for base receptacle outlets are very often bent or even broken during the course of pouring concrete. The result is that the electrician must waste valuable time realigning conduits to conform with outlet box knockouts and, if broken, he must make a difficult cut-and-thread job close to the slab and replace the cracked conduit section with a nipple.

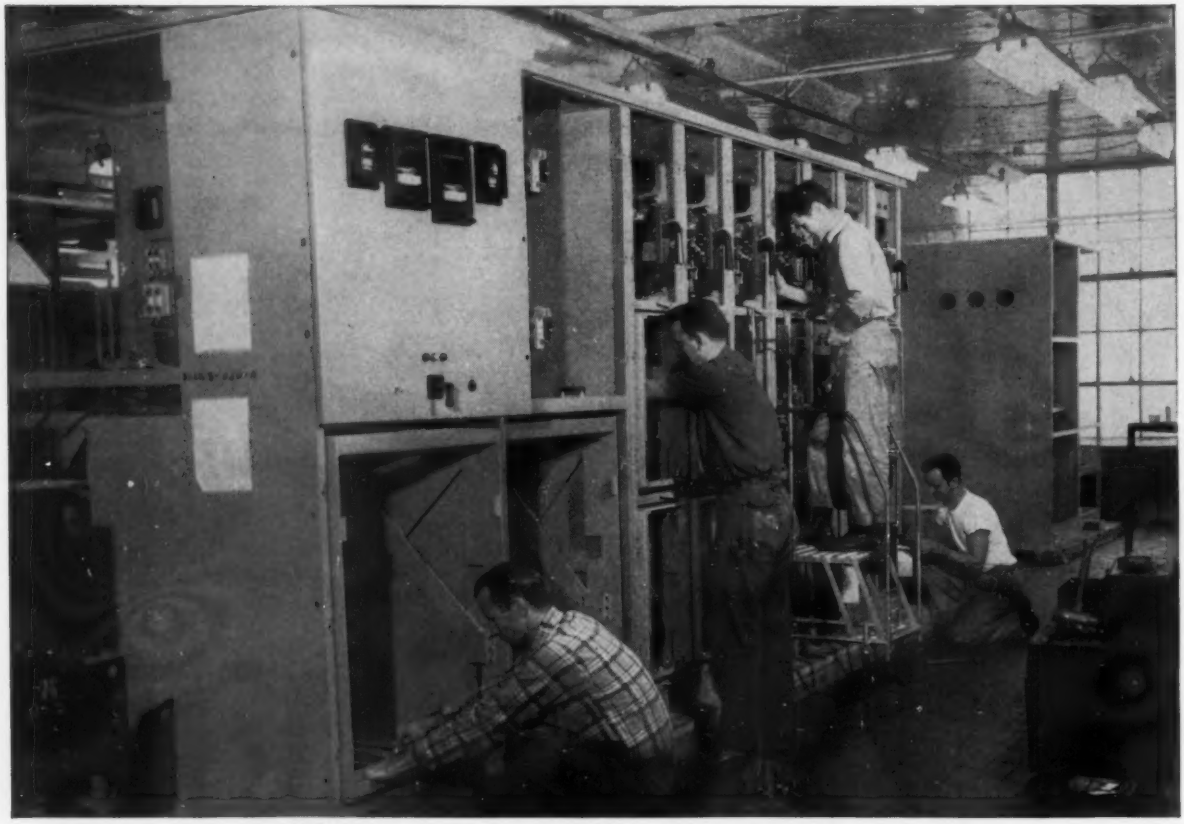
A quick and expedient method of avoiding this trouble is employed by Boro Electric Installations, Brooklyn, N. Y., contractors. Strips of galvanized steel, measuring about 1½ by 4 in., are stamped with three circular holes the size of a standard outlet box knockout. Spacing of these holes is identical with that of ko's of regular boxes. The ends of the strips are rounded to facilitate handling and to avoid cuts and scratches from rough edges.

As conduits are installed, the mechanic merely places one of these "eyeglasses" between the locknut and bushing of each pipe terminal. The resulting connection assures proper spacing of conduits and, in addition, provides a certain amount of reinforcement by securely binding the conduits together.

When the outlet box is to be installed, the mechanic slips off the bushings and the eyeglasses then places the box on the conduits and resecures the bushings. The eyeglasses are removed to allow the locknut to bite into the box itself, thus affording a more positive bond.

Boro Electric's men have another device they use to make certain that conduit stubs are perfectly vertical. This consists of a strip of sheet metal crimped slightly to give it rigidity: the base of the strip is bent over at right angles to provide a foot for nailing the strap to the slab form. Conduit stubs tied to the strap with wire are close enough to the true vertical to assure they will not protrude from partitions, no matter how thin the walls may be, thus avoiding call-backs during erection of walls.

PERFORATED STRAPS have holes exactly the size of knockouts that are spaced to duplicate ko spacing on standard outlet boxes. After the pour, boxes are slipped on by removing bushings and straps. Sheet metal support bar helps keep stubs in vertical plane of future partitions.



ASSEMBLY—In process of assembly is this standard low voltage switchgear unit.

A sound investment—standardize on I-T-E Low Voltage Switchgear

Before you specify low voltage switchgear, check the advantages offered by I-T-E. It is the finest of modern switchgear—factory assembled; shipped as a unit; ready to install; providing the maximum in dependability, safety, reduced maintenance costs, and attractive appearance.

I-T-E Circuit Breakers are the heart of the gear. Their performance in providing maximum protection has been proved conclusively in thousands of installations. I-T-E Structures are designed specifically to house and interconnect these time-tested protective devices and auxiliary equipment. When you combine the two, you get the finest of circuit breakers in the finest of structures—with much less special engineering, much faster delivery, and units tailor-made in standard frames to fit your requirements.

Standard I-T-E Low Voltage Switchgear Assemblies are available with ratings through 6000 amp continuous and 100,000 amp interrupting, 600 v a-c and 250 v d-c. For details, contact the I-T-E field office nearest you. Look in your classified directory under Electric Equipment, or write for Bulletin 6004A. I-T-E Circuit Breaker Company, Switchgear Division, 19th and Hamilton Sts., Philadelphia 30, Pa.

INSTALLED—A standard I-T-E low voltage switchgear unit in operation.

I-T-E CIRCUIT BREAKER COMPANY, Switchgear Division

CONVENIENT LIGHTWEIGHT CARRIER for toting small fittings such as locknuts and bushings about the job is quickly assembled by soldering the top edges of six No. 2 cans together. Carrying strap of 6- or 8-gage iron wire is passed through holes in the two end containers. Similar units of larger containers may be used for wiring devices, plates, or connectors.

Planned Wiring For Broadcasting Center

DISTRIBUTION

Making haste slowly—as practiced by the Miami Valley Broadcasting Corporation and the Austin Company during a 5-year period of study and designing—resulted in the creation of an efficiently functional broadcasting center located five miles southeast of Dayton, Ohio. This center, tripling the size of Station WHIO's original structure, contains two studios devoted to television, three studios for radio use, complete audio and video control facilities, administrative offices and ample provisions for expansion (to include color TV presentations), equipment repair, prop storage and public reception.

As indicated in Fig. 1, the main TV studio is spacious (50 by 65 ft) and is liberally equipped with both lighting equipment and power distribution mediums. Lighting units include a variety of scoops, Fresnel-lensed spots, barn-door floods, border strips and luminaires for many special effects. These units are variously mounted on pantographs, pipe battens and ceiling hangers, while power for their use is distributed overhead via square metal raceways, trolley ducts and conduit-served plug-in centers. This same general lighting and distribution plan is also utilized on a slightly smaller scale in the second TV studio as well.

Situated between these two studios are the related glass-enclosed announcer, director and sponsor booths, plus a compact 2-level TV control core consisting of a master control room at mezzanine level (Fig 2) and a control equipment room directly beneath it (Fig 3).

By locating this video control center between the two studios, common control equipment can be used for programs originating in either studio, while control personnel can be isolated from the distraction of all studio activities.

As pictured, all projection and monitoring facilities are installed in full view of the large control console and —with the related equipment located directly beneath—connecting wiring is simplified and reduced to a minimum. Conduit and cables, linking mezzanine-based console and control equipment with first-floor equipment racks and PBX units, pass through floor-slab openings to expanded-metal cable troughs, where wiring is constantly and completely accessible and adaptable for circuit inspection, rearrangement, expansion, tapping or splicing.

FIG. 1—Spacious TV studio is spanned by maze of square metal raceways, trolley ducts and conduit-enclosed circuits serving wide variety of light scoops, lensed spots, shuttered floods and border strips.

FIG. 2—Video control console overlooks monitoring screens and filming facilities. Same equipment is common to programming from either of the two studios that flank this central control core in WHIO station.

FIG. 3—Equipment room directly beneath master control console is equipped with expanded metal cable troughs for accessible wiring, self-contained air conditioning unit, equipment testing and repair facilities.

Illumination in offices, reception rooms and utility areas is variously recessed, suspended, shielded or diffused, while air conditioning in the structure is obtained through two reciprocating-type refrigeration compressors serving three air-handling units, plus a separate self-contained unit located in the equipment room. Air conditioning control is automatic.

Modified Oil Can Cleans Motor Oil Cups

MAINTENANCE

The addition of a stiff brush to the spout of an oil can could effectively lengthen the life of motor bearings which require occasional lubrication. Most plain sleeve motor bearings are fitted with spring-lid oil cups, which accumulate dust between oilings. If the lid is lifted preparatory to oiling without clearing away this dust, some of it will fall into the cup and pass to the bearings, with a danger of shortening their life.

Where oiling is done as a regular maintenance task, it is useful to equip a standard pump-type oil can with a small brush, such as a tooth brush with stiff nylon bristles. This can be done simply by cutting off the handle of the tooth brush, forcing two wood screws into the back of the brush, and then soldering the screw heads to the spout.

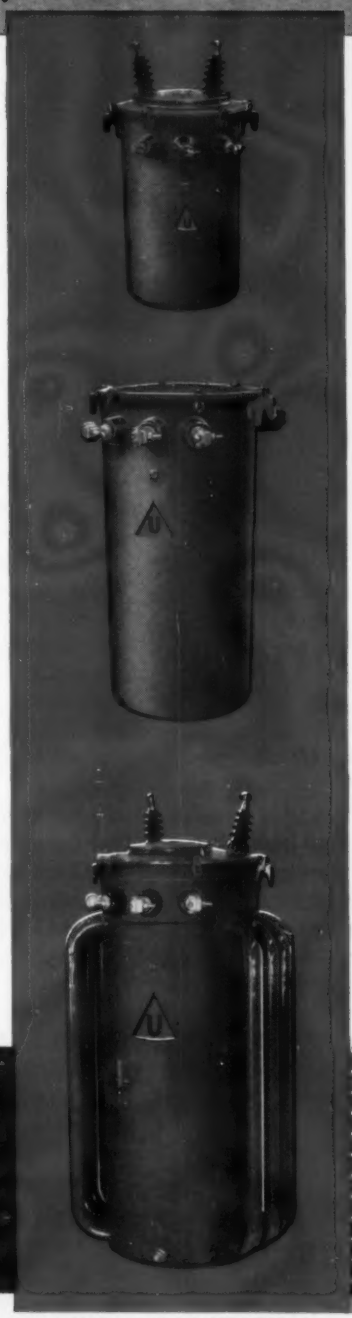
The resulting brush-equipped spout can be slipped into spaces too small to admit a hand holding a cleaning rag and can be used effectively to clean the cap and sides of the oil cup before opening.

OIL CUPS over motor bearings may be readily cleaned before oiling by fitting tooth brush bristles to the end of an oil can spout.

UPTEGRAFF

OVERHEAD TYPE UD TRANSFORMERS

for power distribution



WINDINGS

Long life is assured by the generous use of high rag-content fullerboard insulation, tied-in turns to meet short circuit forces and heat-reactive insulating varnishes.

CORE

Made from high-grade oriented-type steel. Has low exciting current and low noise level, and remains permanently tight to insure consistent, quiet performance.

TAP CHANGERS

Uptegraff designs feature accessibility, legibility, short-circuit capacity, non-deformable mountings, 360° rotation stops and exceptionally high insulation strength.

BUSHINGS

Securely clamped internally, with generous gasket area to prevent failure of seals. High-voltage bushings (under 15 KV) have spring-loaded contacts; low-voltage have tinned contacts; both for either copper or aluminum conductors.

TANKS

All parts arc welded. Shot blasting assures adhesion of primer and finish coats of durable transformer paint. Rolled flange on cover permits high-pressure uniform gasket seal.

SIZES AND RATINGS

Type UD Transformers are built in sizes from 3 KVA to 100 KVA with ratings up to 15 KV.

Write for free copy of new bulletin that details characteristics and other pertinent data.

R. E. UPTEGRAFF MANUFACTURING CO.
Scottdale, Pennsylvania

R. E. Uptegraff Manufacturing Co.
Scottdale, Pa.

NAME_____

ADDRESS_____

CITY_____ STATE_____

ECM

Wiring Closets Built in Air Shaft

CONSTRUCTION

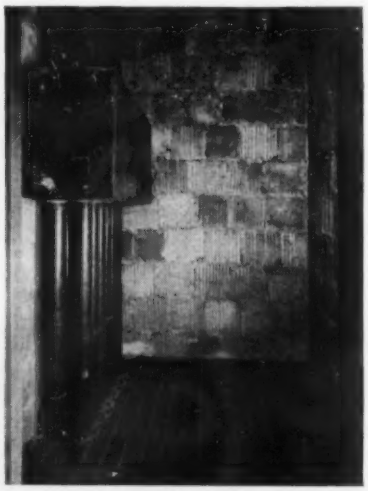
An 8-by-8-ft shaft rising through the 53-floor Lincoln Building in New York City has been used to furnish space for new conduit risers and electrical closets.

To relieve the building's increasing electrical demands, new feeder lines were run to all floors through this open shaft, which extends from the mezzanine almost to the top of the building. Closets were built in at each floor level of the shaft to accommodate new distribution equipment required for various floor electrical loads.

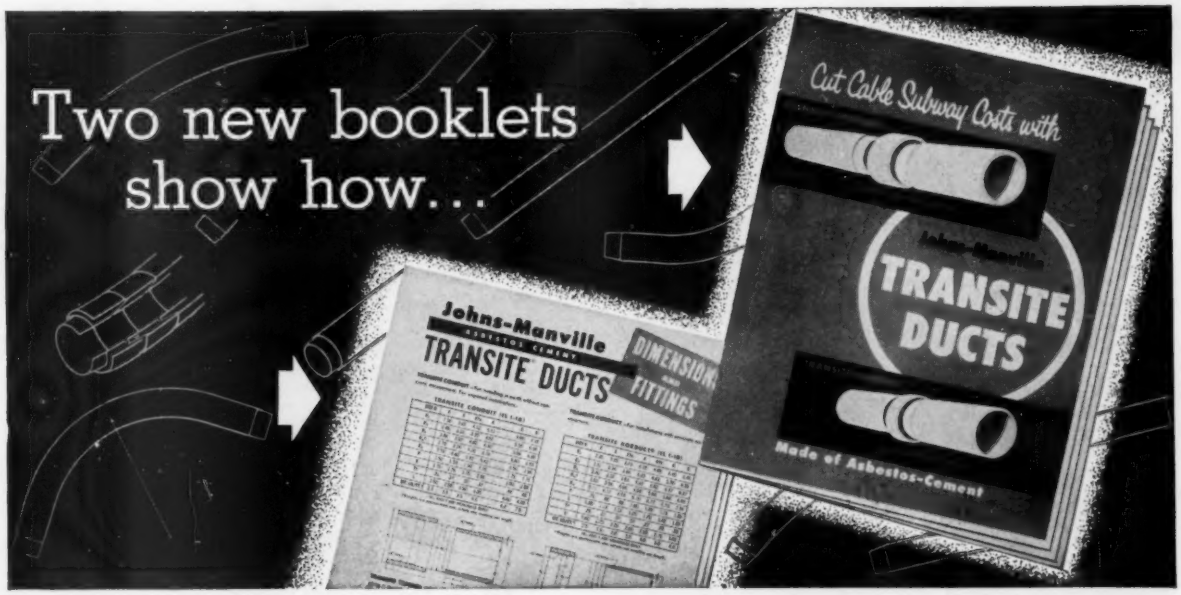
They were fitted with metal gratings to provide both a walking surface and ventilation for the shaft. Openings to bring in the new conduit were left at the rear of the shaft; supports for the metal gratings helped support the new risers. Because of the great amount of conduit already installed in the risers, it was necessary to design new supports to hold the new risers rigidly against the steel framing.

All closetwork was completed before the electrical work was begun. Slightly more than 2½ miles of new conduit were added to the existing system. Old dc switchboards in the basement were converted to ac; a new ac board and three 6500-amp service switches were installed. From the service switches two sets of service feeders were run to the converted dc boards and one to the new ac board.

Since the new risers were not filled to capacity, the expanded system is not only completely adequate for present needs, but it can be expanded for future demands at small cost.

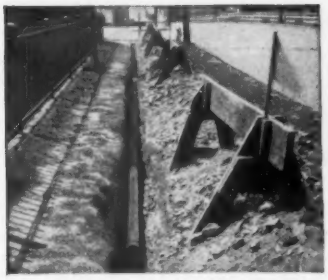


METAL GRATING built into air shaft provides access to pull boxes and distribution equipment mounted on shaft walls.

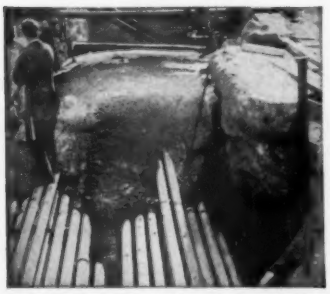


Transite® Ducts cut cable subway costs—

give greater cable protection



Transite Conduit is the thicker walled duct which is used for exposed work or is laid directly in earth without a concrete encasement. Saves time, labor and materials on the job



Transite Korduct® is the thinner walled duct for installation in concrete. Inasmuch as it is used principally for hi-voltage lines, its high thermal conductivity reduces operating losses.

• Johns-Manville presents these brochures as a service to public utilities, design engineers, and all other users and planners of cable subway systems. "*Transite Ducts*" shows how improved cable subway protection, installation, maintenance and operational savings may be achieved. "*Transite Ducts, Dimensions and Fittings*" give the necessary dimensional data on all ducts and fittings.

Transite Ducts offer improved cable subway protection. Made of asbestos and cement, Transite cannot burn, smoke, fume or generate explosive gases. Transite confines arc damage and protects adjacent cables against heat and flame. Transite resists corrosive action of soils; is unaffected by electrolysis.

Installation savings result because Transite is strong, light in weight, easy to handle. It comes in long, 10-foot sections, thus, fewer joints are required. Its permanently smooth bore prevents injury to cable either from natural movement or when pulling cable through. Maintenance savings result from the permanent nature of the asbestos cement composition of Transite. It is as durable as stone.

Moreover, operational savings result because cables run cooler due to the high thermal conductivity of Transite Ducts. This also results in prolonged cable insulation life.

For complete details on how Transite Ducts can cut cable subway costs for your system, send for copies of "Transite Ducts," EL-29A and "Dimensions and Fittings," EL-45A. Write to Johns-Manville, Box 60, New York 16, New York. In Canada, 199 Bay Street, Toronto 1, Ontario.

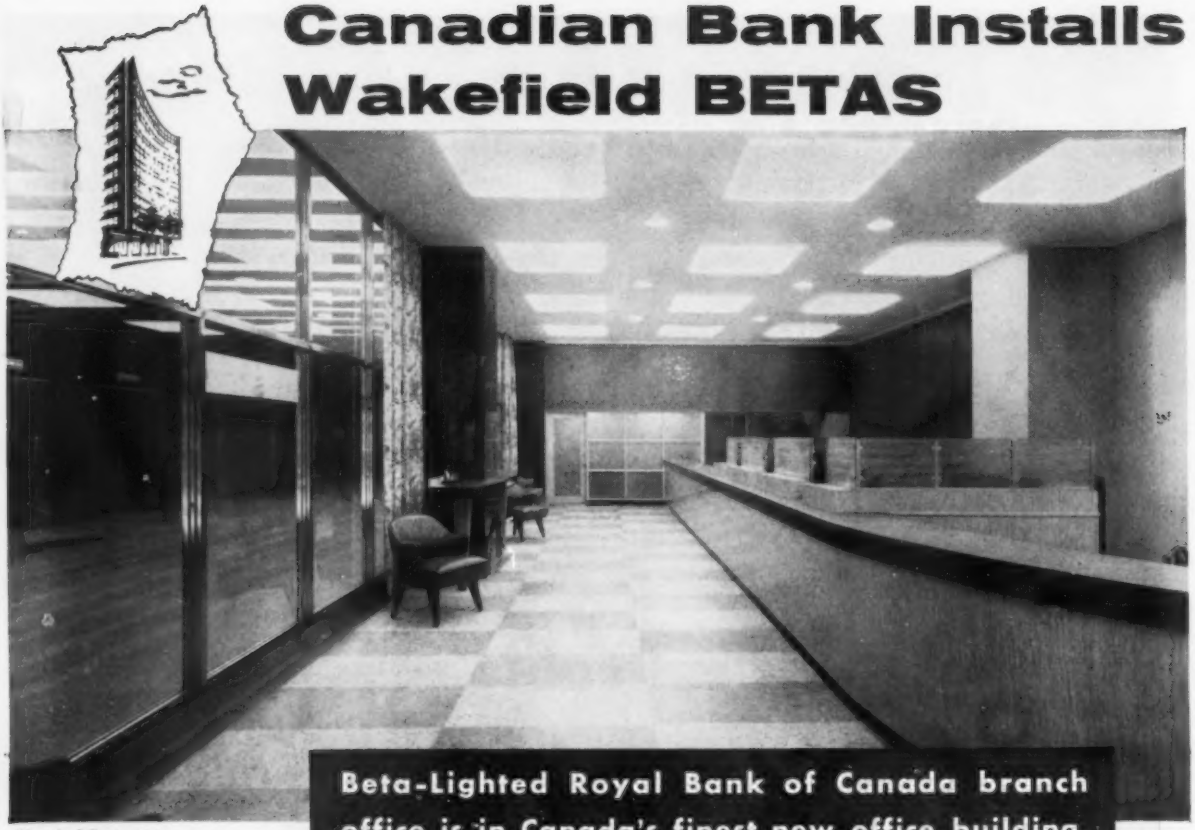
JOHNS-MANVILLE JM PRODUCTS

Johns-Manville TRANSITE DUCTS

TRANSITE KORDUCT—for installation in concrete

TRANSITE CONDUIT—for exposed work and installation underground without a concrete encasement

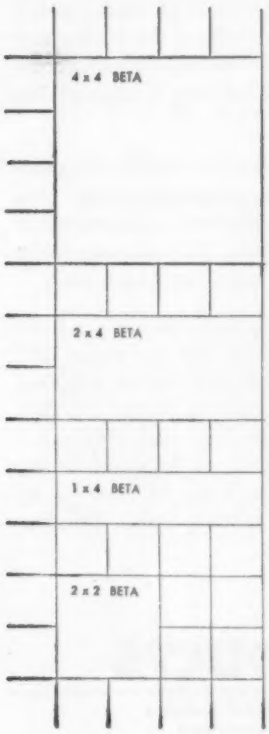
Canadian Bank Installs Wakefield BETAS



Beta-Lighted Royal Bank of Canada branch office is in Canada's finest new office building, NINETEEN EIGHTY SHERBROOKE WEST, Montreal

Electrical Contractor:
Standard Electric Contracting
Montreal

Electrical Distributor:
Shortall Electric Ltd.
Montreal



Called "the building that couldn't wait for the future", Montreal's Nineteen Eighty Sherbrooke West "was designed for a nation on the threshold of greatness". One of the occupants is the Royal Bank of Canada, which elected to establish one of its latest branches in this beautiful building.

See how beautifully Wakefield recessed Beta units light this smart interior, how readily they complement the modern design. These are the 4′x4′ size, with six 40W rapid start bi-pin lamps. Maintained footcandles: 30 to 40.

Betas also come in 1′x4′, 2′x4′ and 2′x2′ sizes. Each is a self-contained unit with a Rigid-Arch plastic diffuser whose non-specular finish does not mirror reflections from the street.

For a brochure on the Wakefield Beta, write The Wakefield Company, Vermilion, Ohio. In Canada: Wakefield Lighting Limited, London, Ontario.

THE WAKEFIELD COMPANY
VERMILION, OHIO
WAKEFIELD LIGHTING LIMITED
LONDON, ONTARIO

Modern Lighting

Relighting From The Top Down

Two upper floors of a 17-floor hospital have been relighted by the Frame Electric Company for the University of Pittsburgh School of Medicine's Western Psychiatric Institute and Clinic. These floors, formerly occupied by maintenance personnel in the building, were originally high-ceilinged deep-beamed areas lighted unevenly to levels not exceeding 14 footcandles, with stem-suspended incandescent units used for that purpose. Now, however, the floors are devoted to research and experimentation work, they are freshly tiled and equipped with modern laboratory equipment, and they are evenly illuminated to intensities of 57 footcandles by means of 2-lamp fluorescent luminaires mounted in continuous rows.

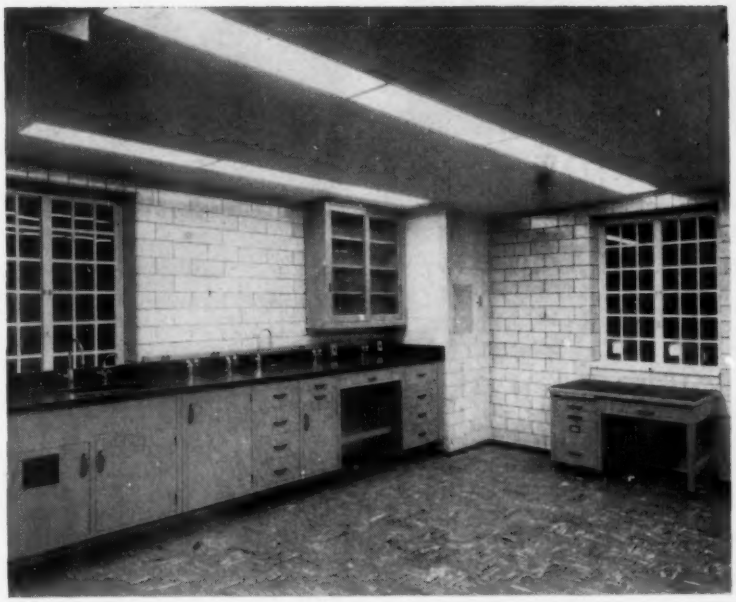
Since original wiring connected to concrete ceiling outlet boxes was not to be augmented or shifted, it was instantly apparent that a conversion from incandescent to fluorescent illumination would be essential if higher intensities were to be obtained. Selection of fluorescent units was also influenced by the reduced heat factor, a more uniform light-distribution pattern, and the streamlined appearance associated with a linear fixture arrangement.

To obtain a smooth-appearing ceiling, acoustical tiling was therefore furred beneath the beam level, and 2-lamp 40-watt luminaires were installed end-to-end adjacent to walls over lab counters, and along the ceilings at intermediate intervals.

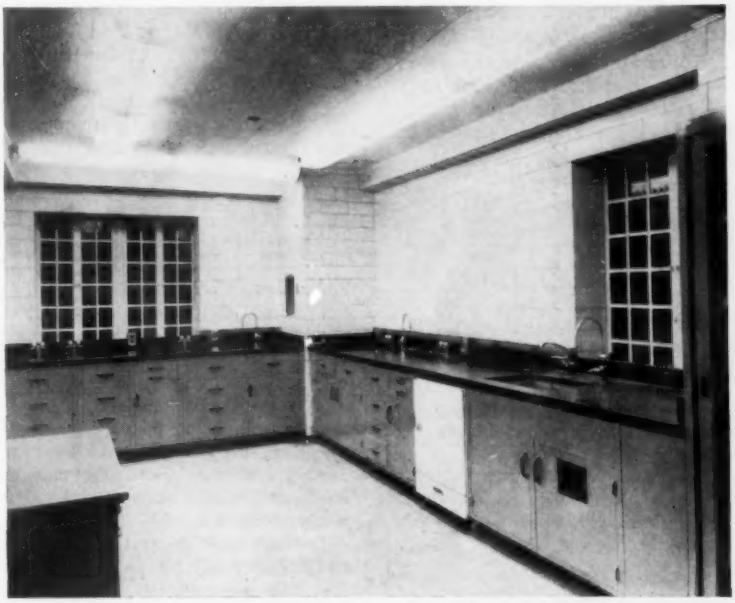
On the 17th floor, Pittsburgh Reflector Company troffers with hinged Alba-lite diffusion panels were selected while, on the 16th floor, Sylvania louvered fixtures were surface-mounted in comparable arrangements on the acoustical ceiling panels. Lamps used were bi-pin instant-start tubes, either warm or cool white, depending upon the function of the various laboratories being illuminated.

Along the rear of all table tops are duplex ac and single-outlet dc receptacles, while tiled corner column enclosures contain wall boxes and wiring related to intercom and signal systems between floors.

This relighting program was designed and installed exclusively by the electrical contractor who worked



RECESSED TROFFERS with hinged Alba-lite diffusion panels are installed on the 17th floor of this research and experimentation project. Single-outlet dc and duplex ac receptacles are conveniently located along the rear of all work areas. Footcandles on table tops average 57.

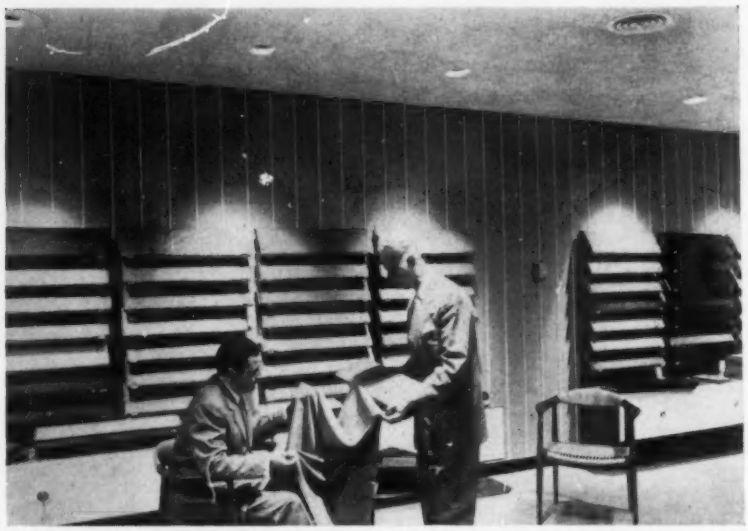


SURFACE-MOUNTED FIXTURES with cross louvers are installed on the 16th floor. High reflection factors are related to bright ceiling, wall and floor surfaces, while arrangement of fixtures gives low-brightness high-intensity illumination without shadows or glare at all experimentation stations.

directly with the school authorities, planned the layouts, selected and purchased the fixtures.

The objectives which were obtained included a hung ceiling that gave a smooth expansive impression while providing ample wiring space above it; low-brightness high-level illumination in the laboratories; the elimination of shadows on all working areas; high reflection factors for walls and floors as well as for ceilings, plus facilities for plugging-in supplementary lighting units if required on the table tops for the more brilliant illumination of critical-seeing tasks sometimes involved in laboratory work.

Approval of the completed project was obtained in a most gratifying form, via a request to duplicate the installation on lower floors in the same hospital building.



MATERIALS DISPLAYED beneath intensities up to 150-footcandles clearly reveal texture, patterns, weaves and coloring in this custom shop for men's wear.

Men's Shop Lights With Spots and Lenses

The accompanying illustration shows wall racks, displaying samples of suiting material, in the mezzanine custom shop of Rogers Peet Company, Fifth Avenue, N. Y. C. Intensities on these samples range from 150 to 100 footcandles (top to bottom), delivered by Gotham recessed asymmetrical downlights equipped with 150-watt PAR-38 spotlamps.

The area in general is illuminated to an average of 70 footcandles by means of Gotham Fresnelens units, recessed on centers of 8 by 9 ft and equipped with 300-watt inside-frosted incandescent lamps. In this installation, Carson & Lundin were the architects; Raymond Loewy the interior designer; Smith & Silverman the consulting electrical engineers; J. Livingston & Company the electrical contractors.

180 Footcandles for Newspaper Composition

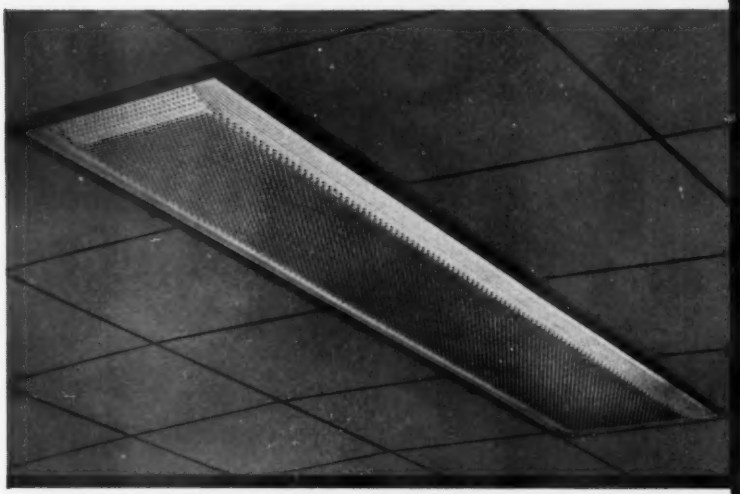
Newspaper composition is an exacting job, demanding both accuracy and speed to insure errorless typography under the constant pressure of deadlines for succeeding editions. Therefore it is in the interest of tangible efficiency to provide maximum visibility, proper color values, minimum glare, even distribution and the abolition of shadows by the most practical means available.

Dramatically illustrating what can be accomplished by planned relighting, the accompanying illustrations show conditions before and after new equipment was installed for the *Milwaukee Journal*, Milwaukee, Wis.

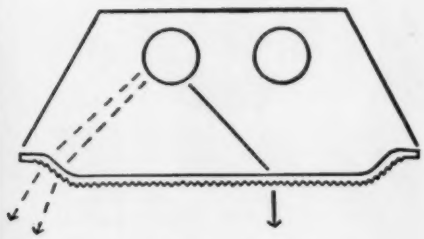
As indicated, the formerly-installed dome reflectors created harsh shadows as well as countless points of glare, and the intensity of lighting, averaging from 15 footcandles downwards, was far too low for either efficiency or personnel comfort. Eye strain was common, composition time was relatively great, errors were not uncommon and complaints concerning the installation were numerous.

After installing eggcrate-louvered 4-lamp fluorescent industrial fixtures in continuous rows over each line of benches, however, footcandle levels jumped to 110 for straight editorial composition. And, by installing intermediate rows of units in the classified make-up section, lighting intensities

ARCHITECT'S AND ENGINEER'S FACT SHEET



Corning uses pyramidal and linear prisms to get maximum light control in this interesting new low-brightness lens panel.



Pyramidal prisms in the center portion concentrate light from the tubes and reflector so that it leaves the fixture at angles below the glare zone. The linear prisms have a uniform down-bending action controlling the light which might otherwise escape at higher angles from the slanted sides.

ANNOUNCING...

Corning's New Low-Brightness Curved Lens Panel

Corning has put two kinds of prisms and a curve in one new panel to give you a new combination of beauty and utility in your lighting design.

Pyramidal prisms in the panel's center section concentrate light from the tubes and reflector at angles below the glare zone. Linear side prisms have a uniform down-bending action on light that might otherwise escape at higher angles. You get a high coefficient of utilization.

Away with monotony

With the new Corning Curved Lens Panel, the architectural boredom of "flat" ceilings with recessed troffers is no more. Lighted or unlighted, the curved contour and the prism pattern lend new interest to ceilings and fixtures.

You can get this *new* lightweight Corning panel in lengths up to 48", with open or closed ends. They're easy to maintain, will never discolor or sag.

To get complete information on Corning's Low-Brightness Curved Lens Panel, simply mail the coupon. Or, contact your Corning lightingware representative.

Information on Corning Low Brightness Lens Panel

LENGTH: Code 541371—47¾" both ends closed.
Code 541372—12", 24", 36" or 48" both ends open.
Code 541373—11⅞", 23⅞", 35⅞", 47⅞" one end closed.

LENGTH TOLERANCE: ±⅛".
On 541372 only +0 −⅛".

WIDTH: 10⅞" ±⅛". DEPTH: 2⁷⁄₃₂".

THICKNESS: .180".

WEIGHT: 2.0 lbs. per running foot.

SUGGESTED SPECIFICATIONS

The lens panel for the fluorescent fixtures shall be a continuous curved lens made of colorless crystal glass. It shall be of the low brightness type, with configuration of six-sided pyramids in the center section, with linear down-bending prisms in the side areas.

Dimensions and suggested specifications.

AVERAGE BRIGHTNESS (Ft.-L)

Angle	2480 Lumens Across Axis	2480 Lumens Along Axis	2560 Lumens Across Axis	2560 Lumens Along Axis
85°	302	233	312	240
80°	320	252	330	260
75°	295	313	304	323
70°	300	412	310	425
65°	315	532	325	549
60°	375	607	387	626
55°	504	723	520	746
50°	682	841	704	868
45°	885	967	913	998
40°	1047	1077	1081	1112
35°	1137	1142	1174	1179
30°	1155	1182	1192	1220

CORNING GLASS WORKS
CORNING, N. Y.

Corning means research in Glass

CORNING GLASS WORKS, 66-8 Crystal Street, Corning, N. Y.
Please send me information on Corning's New Low-Brightness Curved Lens Panel.

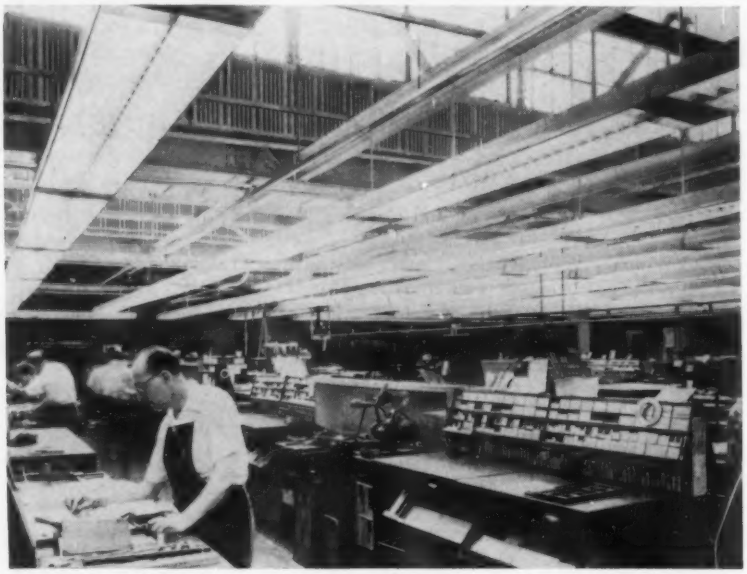
Name.....Title.....

Company.....

Address.....

City.....Zone.....State.....

GLARE AND SHADOWS characterized this newspaper composition room, where light levels below 15-footcandle were common, and where eye strain and errors were prevalent.



CONTINUOUS ROWS of louvered fixtures equipped with 96T12 fluorescent lamps now provide intensities up to 180-footcandle in the classified make-up sections.

climbed still higher to 180-footcandle.

Visibility was quite naturally improved, while comfort, accuracy, speed and morale rose correspondingly.

To obtain the highest possible efficiency from the new lighting installation, the units were hung at a height of ten feet above floor level. This mounting height was considered best since it delivered the required high intensity while still keeping light sources above the normal line of vision. Further protection from glare was included into new system by employing egg-crate louvers in the fixtures. These assemblies provide a thirty degree longitudinal cutoff and also have thirty degree lateral shielding. Since the height of the units is ten feet, all lamp surfaces are out of range of vision of personnel standing seven or more feet from the vertical plane of the fixture's location.

While the original lighting equipment was supported by its own conduits which rested on the low-level purlins, the weight of the new system necessitated the installation of a gridwork of structural I-bars suspended by rods from the roof beams above. Units were in turn hung from this grid.

Like Easy Bending?

GET NE Sherarduct

RIGID STEEL CONDUIT

Easy bending and fast installation go hand in hand. That's why so many cost conscious contractors prefer National Electric Sherarduct rigid steel conduit. They've found the gradual heating and cooling of NE's Sherardizing process of dry galvanizing normalizes the metal in an annealing-like process that assures easier working, forming and bending on the job.

And they like other Sherarduct features as well. For example:

EASY FISHING . . . In addition to a smooth inside surface, Sherarduct's accurately cut threads let conduit ends butt inside the coupling . . . eliminate gaps that interfere with easy fishing.

LIFETIME PROTECTION AGAINST CORROSION . . . The Sherardizing process that alloys zinc with the conduit wall, plus a baked-on Shera-enamel coating fortifies Sherarduct against rust and corrosion for life. All surfaces, including the hill and valley of every thread, are securely protected against corrosion.

Write for a free copy of our Sherarduct facts book. You'll see why Sherardizing makes Sherarduct "galvanized conduit at its best."

LIFE-TIME CORROSION PROTECTION
•
EASY FISHING
•
ZINC PROTECTED THREADS
•
STRONG COUPLINGS
•
THOROUGH GROUNDING
•
EASY BENDING

Listed by Underwriters' Laboratories, Inc.

Sherardizing is galvanizing at its best . . . Sherarduct is galvanized conduit at its best

NATIONAL ELECTRIC PRODUCTS CORP. PITTSBURGH, PA. 50TH ANNIVERSARY 1905–1955

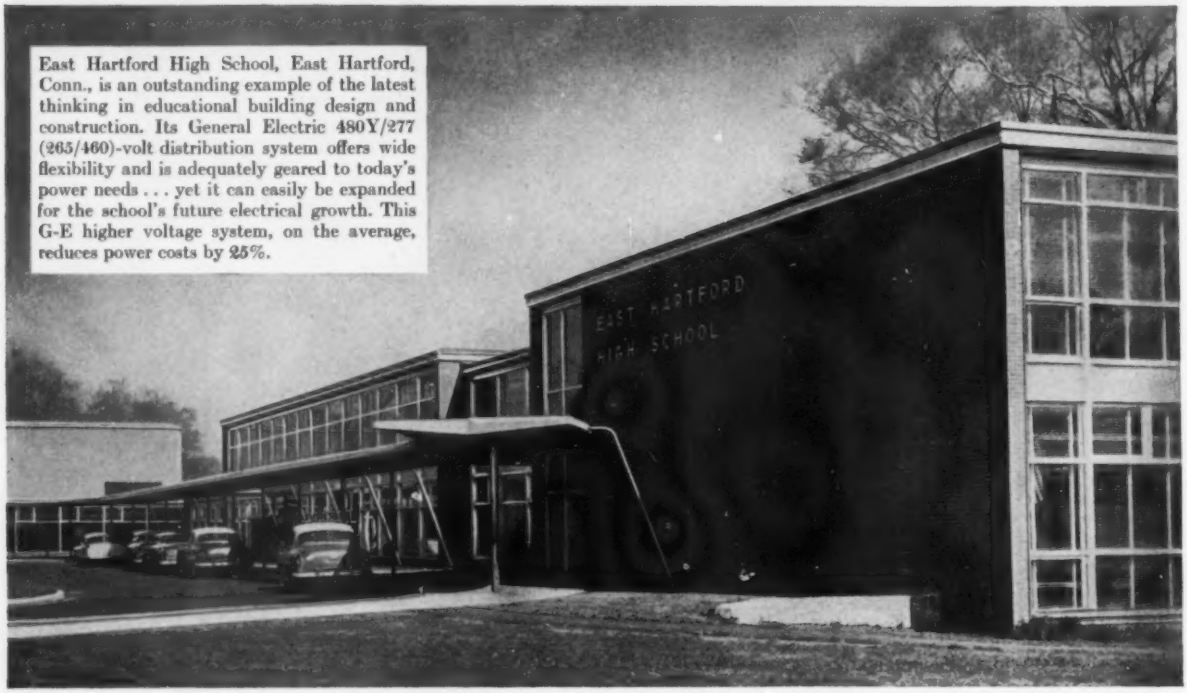
National Electric Products

PITTSBURGH, PA.

3 Plants • 10 Warehouses • 36 Sales Offices

"PACKAGED" DISTRIBUTION SYSTEMS HELP PUT

Here's how General Electric "System Engineered" Distribution Equipment provides more power at less cost . . . and cuts installation time and expense



East Hartford High School, East Hartford, Conn., is an outstanding example of the latest thinking in educational building design and construction. Its General Electric 480Y/277 (265/460)-volt distribution system offers wide flexibility and is adequately geared to today's power needs . . . yet it can easily be expanded for the school's future electrical growth. This G-E higher voltage system, on the average, reduces power costs by 25%.

In today's schools or factories, in commercial buildings or institutions, General Electric "System Engineered" equipment *saves from the beginning* because it is designed to work together as a completely *integrated system*. G-E equipment is built to lower original investment, to cut installation costs and to reduce on-the-job operating expense.

There are 7 *work-together* advantages inherent in all G-E "System Engineered" distribution equipment that offer benefits to both contractor *and* user.

1. True extendability because G-E standardized components are compact and accessible . . . especially designed for easy addition or relocation.

2. Easy-to-assemble. Flex-A-Power* Busways, for example, quickly bolt together, reduce labor and maintenance costs.

3. No loss when moving and reinstalling distribution equipment. "System Engineering" provides for practically 100% re-use of materials.

4. Complete relocation of loads without rewiring with G-E Flex-A-Power plug-in distribution bu sways.

5. Maximum electrical efficiency and minimum maintenance from components designed to work together.

6. One source of supply for all components ends procurement problems and reduces costs.

7. Skilled planning service from G-E Engineer who is selling not just components, but complete electric distribution systems to make sure your installation has a built-in future.

General Electric Stage Lighting Control Switchboard installed in East Hartford High School auditorium. Switchboard provides outstanding flexibility through extensive presetting and wide application of remote control.

For additional information on higher voltage distribution systems, write for General Electric's new bulletin (GEA-6223), "Modern Distribution Equipment." Address:

General Electric Company
Distribution Assemblies Department
Plainville
Connecticut

Architects—Nichols & Butterfield, West Hartford, Conn.
Consulting Engineers—Marchant & Minges, West Hartford, Conn.
General Contractor—A. F. Peaslee, Inc., Hartford, Conn.
Electrical Contractor—Theodore D. Bross & Co., Hartford, Conn.
Distributor—General Electric Supply Co., Hartford, Conn.

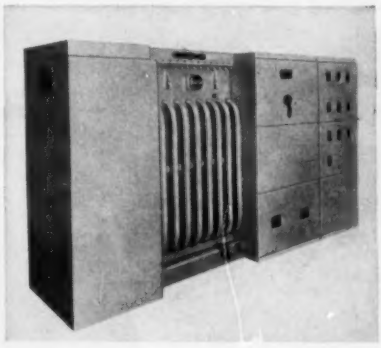
LID ON SOARING SCHOOL CONSTRUCTION COSTS

Busways—Flex-A-Power* Busways at East Hartford High School. These are available with either copper or aluminum bus bars, are erected easily with "building block" sections of standard lengths. Prefabricated fittings allow rapid assembly tailored to various plant contours.

Stage Lighting Switchboards—Both mechanical and electronic types are available to exacting specifications for schools, TV studios, auditoriums and theaters. Dead-front construction provides maximum safety of operation, even for non-professionals. Easy-to-use controls. Factory pre-wired.

Control Centers—New G-E Type DA7093 motor control center with short-circuit rating of 50,000 amperes occupies 50 percent less floor space than conventional equipment. Standardized, self-supporting.

Panelboards—Types NAB, NHB, NLTQ, NLTQX, NTP, and NTC for lighting; Types NCB, CCB, Swing-Wa* and Converti-Fuse* panelboards for power distribution. Full line. Factory assembled.



Sectional Type Distribution Center Unit Substations—Factory assembled to reduce installation cost. Short secondary feeders in load center system mean low voltage drop. Easy-to-order arrangements.

*Registered Trade-mark of General Electric Company

Progress Is Our Most Important Product

GENERAL ELECTRIC

What is your Control Need?

. . . a starter for a fractional hp motor?

This small inexpensive control provides thermal overload protection. . . . Compact construction permits mounting where space is at a premium. Designed for use on ac single-phase power systems . . . up to 230 volts.

. . . a controller for a 2300 to 5000-volt motor?

Here is a control for motors up to 2500 horsepower. All components — contactors, meters, overload relays, auxiliary switches — are selected to meet the particular requirements of your application. Current-limiting fuses give split cycle short circuit protection.

. . . or other applications?

Specific applications, including those between the above-mentioned limits, are made from an extensive line of starters and control components. These standard units are factory assembled in infinite combinations to meet practically any requirement. For help on a particular application, call your Allis-Chalmers representative. His recommendations are backed by Allis-Chalmers engineering departments . . . by experience gained solving thousands of control problems . . . by complete research and testing facilities.

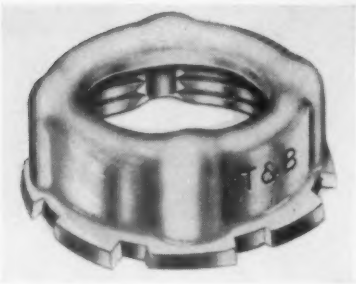
A-4721

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

Milwaukee 1, Wisconsin

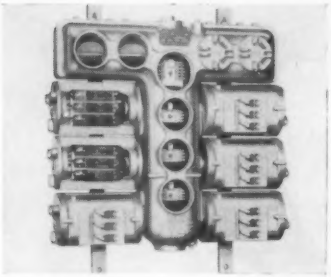
Product News



Steel Bushings (1)

A new ½-in. steel bushing featuring a rolled, turn-back throat, offers greater abrasion protection for tender wire insulation. Full threads run up to and beyond the turnback throat permitting the bushing to be tightened snugly over the conduit. Since threads are fluted, they act like the die of a thread cutter in cleaning dirt and chips from the threaded end of the conduit. It has the approval of Underwriters' Laboratories.

Thomas & Betts Co., Elizabeth, N. J.



Panelboard (2)

A new design in cast aluminum circuit breaker panelboards for hazardous locations. Designated EPB series, they feature triple-sectioned grooved joint, which meshes cover, end plate and body to form a continuous metal-to-metal explosion-proof seal. All inspection and maintenance can be done from the front and two or more panelboards may be installed side by side on close centers with no interference. They are available in 2, 4, 6 and 8 gang types. They take "E" frame and "Quicklag" circuit breakers with from 2 to 24 branch circuit controls.

Pyle-National Co., 1334 No. Kostner Ave., Chicago 51, Ill.

Tapes (3)

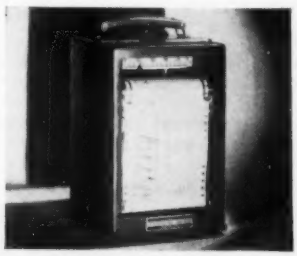
A new line of cable splicing tapes for use with standard steam or electric vulcanizers, known as Okonite Vulcanizer tapes. The line includes rubber insulation, rubber sheath and colored neoprene sheath tapes that are simple to apply and vulcanize into void-free splices. Developed originally to withstand the rough treatment given portable cables, they may be used wherever the immediate, added protection of a vulcanized splice is desired in permanent or fixed cable installations. They are supplied in standard 1-in. width. The rubber insulation tape is grey and the rubber sheath tape is black. The neoprene sheath tape is available in black, red, yellow and green for simplified identification and color-coding. Bulletin 5505 is available.

The Okonite Company, Passaic, N. J.

High Voltage Starters (4)

A new line of high voltage starters with 400-amp current limiting fuses, new air break contactors, and all new steel enclosures. They have ratings of up to 1500 hp at 2300 volts and 3000 hp at 5000 volts, for both induction and synchronous motors, and can be applied on power systems having a maximum fault capacity of 150,000 kva at 2300 volts or 250,000 kva at 5000 volts. The new 400-amp fuse is a single unit with a single mounting. The air-break contactor in ratings of 200 and 400 amps is capable of interrupting 50,000 kva at either 2300 or 5000 volts.

Westinghouse Electric Corp., P. O. Box 2099, Pittsburgh 30, Pa.



Recording Instruments (5)

A new combination of rectifier ac ammeters and split-core current transformer with 500 ma secondary which permits ranges of 0-25/50/100/200 amps, 25-400 cycles. The instruments have the rugged, permanent-magnet, moving-coil measuring element and a copper-oxide rectifier. An internal current transformer provides current ranges of 0-50 ma, 0-1, 1.25, 2, 2.5, 4, 5 and 10 amps. The 5-amp range can be used with E-A Model D portable or any closed-core current transformer as well as Annis split-core transformers. Since the basic measuring element is dc, an ac-dc ammeter is possible as well as both ac and dc voltage ranges. Available self-contained ranges are 0-6 to 0-50 ma dc; 0-1 to 0-10 amps ac; 0-50 to 0-800 volts ac; 0-100 mv dc and 0-1 to 0-800 volts dc. Bulletin 455 is available.

Esterline-Angus Company, Inc., P. O. Box 596, Indianapolis 6, Ind.

Motors (6)

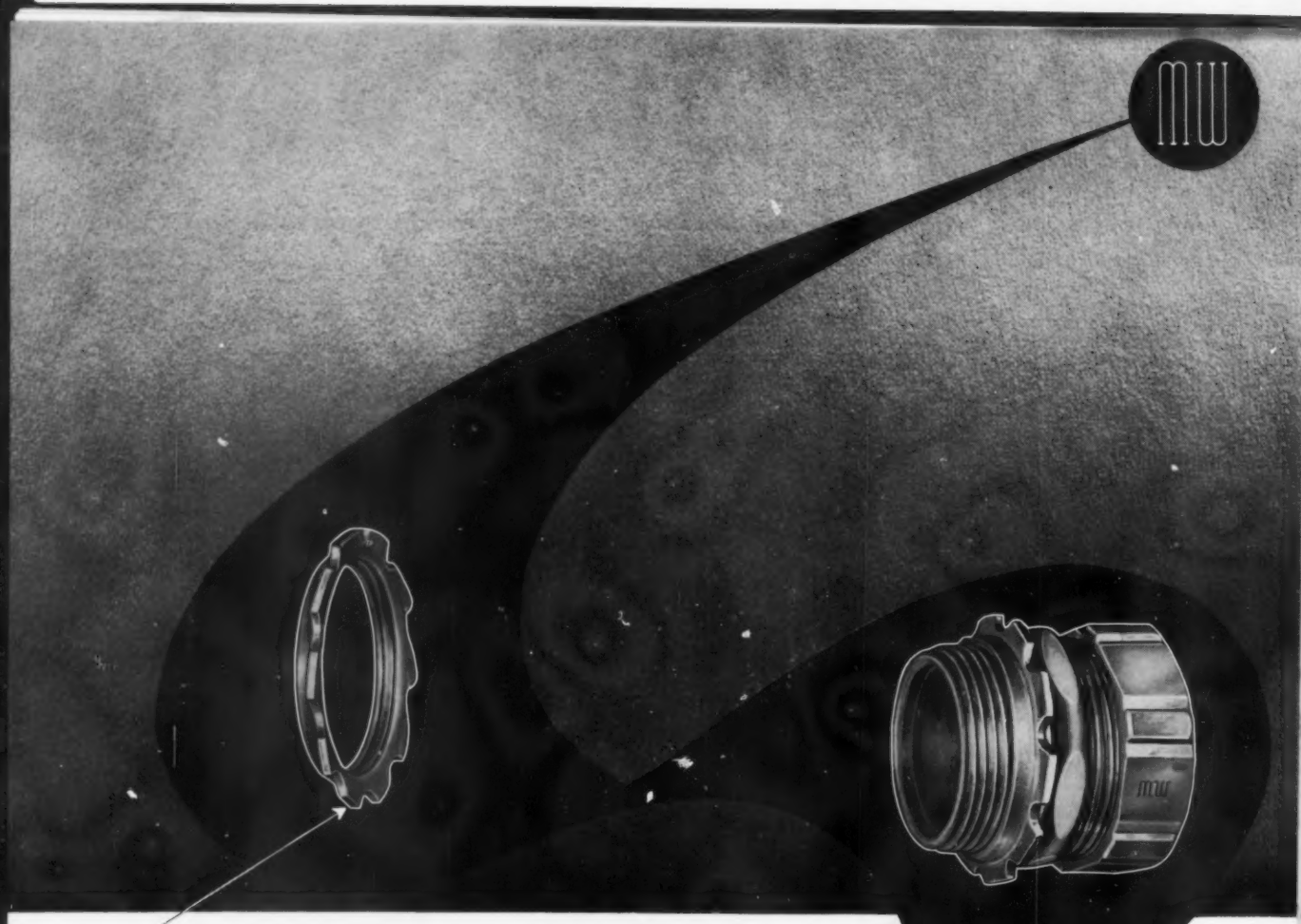
Newly designed standard and explosion-proof totally enclosed motors featuring corrosion-resistant cast iron frames, improved winding insulation and heavy duty ball bearings. Grease fittings are provided at top and bottom of bearing housing to permit lubrication and removal of old grease. A running shaft seal on each end of fan-cooled motors and on drive end of non-ventilated motors prevents entrance of moisture, dirt and other contaminants. Ratings are 1 through 10 hp, 4-pole, 60 cycles in rerated NEMA frames 182 through 256U. Frames 213 and larger are cast with heavy ribs for cooling. The flow of air is directed around all sides of motor by a protective cast iron shield. Smaller ratings are totally-enclosed, non-ventilated. Bulletin MU-203 is available.

Wagner Electric Corp., 6400 Plymouth Ave., St. Louis 14, Mo.

Adjustable Growler (7)

Built with adjustable jaws, 2½-in. face length, this new Type B-1-M growler will test armatures from 1-in. to 18-in. in diameter. It is so constructed that no matter what the setting of the jaw opening may be, the armature is always suspended above the center of the jaws, thus preventing tipping. A meter connected to a secondary winding on the growler shows any change in the magnetic flux of the growler. This method is more sensitive than an ammeter in the line, and will give a large meter deflection in most cases of defective coils.

Martindale Electric Co., 1309 Hird Ave., Cleveland 7, Ohio.



- Multiple locking edges for greater bond. Assures positive ground for electrical system.
- Spring tension against locking surface provides permanent shake-proof installation.
- Reverse bevel on inner surface permits bonding edges to be pulled up tight to locking surface.
- Up to 66% more driving notches for easier working angle, when tightening.
- Heavy gauge steel. Cadmium plated for corrosion protection.

COMPARE THESE midwest LOCKNUT FEATURES...

These "Sure Bond" Locknuts are specifically designed to do a better job. Compare these features against those of other types of locknuts. All Midwest fittings, 2" and smaller, come equipped with "Sure Bond" locknuts.

★ Here is another Midwest development in providing quality fittings. "Quality" is just a condensed way of saying: "Getting the total job done—right—with the most inexpensive combination of material and man hours." Engineering and producing quality fittings to meet the highest standards of electrical wiring installations, is our objective at Midwest.

Midwest Electric Mfg. Company

MANUFACTURERS OF ELECTRICAL WIRING PRODUCTS

1639 W. WALNUT STREET

Switchgear (8)

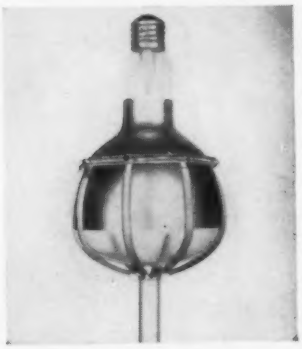
A new line of low-voltage, metal-enclosed switchgear available in indoor and outdoor arrangements, feature new circuit breakers rated 600 amps, 25,000 aic at 600 volts (LA-25) and 1600 amps, 50,000 aic at 600 volts (LA-50). Reversible panels are mounted on each breaker compartment which permit doors to be closed with breakers in the connected, test or disconnected position. Each breaker compartment is barriered from bus compartments independently of the breaker frame and from adjoining breaker compartments by a double steel wall. Outdoor unit has a weatherproof housing and a wide unobstructed aisle between the exterior panel and front of the breaker compartments. This walk-in aisle protects operator from adverse weather conditions and is wide enough to permit breakers to be withdrawn within the structure. Bulletin 18B8283 is available.

Allis-Chalmers Manufacturing Co., 930 S. 70th St., Milwaukee, Wis.

Junction Boxes (9)

Two new explosion-proof junction boxes particularly adaptable to service station wiring and other applications where circuits must be sealed, permitting short, straight runs from building curb to various floodlight locations in a given area. Each conduit is sealed separately. Wires are brought up through the bottom wells and spliced with wires coming in from the various hubs at the sides. Sealing of conduit and conductors is done from the inside of the boxes. Available in curb type and flush type boxes. Curb type is designed for mounting into concrete curbing and makes it possible to pull circuits to a point on the curb within an explosive area for distribution. Flush type is for any flat surface and mounts flush in the concrete. Both boxes are cast in one-piece of aluminum alloy and have conduit stops. Slotted head plugs are provided for use in closing any unused hubs. Boxes conform to Class I, Group D and Class II, Groups E, F and G of the National Electrical Code.

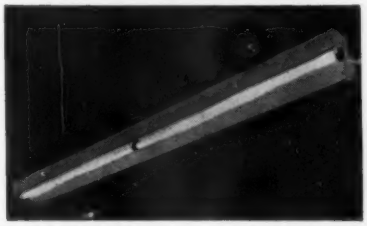
Revere Electric Manufacturing Co., 6007 Broadway, Chicago 40, Ill.



Lamp Changer Head (10)

A new lamp changer head, designated 155-C, and built especially for the R52, 500-watt lamp used in high-bay reflector lighting. Flexible, rubber-covered metallic fingers, held together at top by a coil spring, slip over lamp and grip it for removal or installation. Unit is used with standard lamp changer pole, in 5-ft, interchangeable sections. Sections are locked together by a spring-actuated button which also permits quick disassembly. Each section is insulated for positive protection against shock from exposure on contact of changer pole or head to live wires.

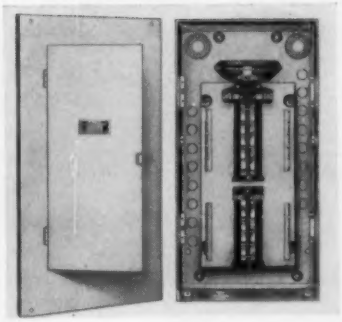
McGill Manufacturing Co., Inc., Valparaiso, Ind.



Lighting Fixture (11)

A new lighting fixture designed especially to illuminate chalkboards, and provide light over the entire writing surface. Fixtures are useful wherever vertical surfaces require supplementary light. Available in 4-, 8- and 16-ft lengths in rapid and instant start. Knockout plugs provide for continuous row mounting. All painted parts are zinc-phosphate Bonderite treated after fabrication to prevent deterioration.

Sylvania Electric Products Inc., 1740 Broadway, New York 19, N. Y.



Bus Enclosures (12)

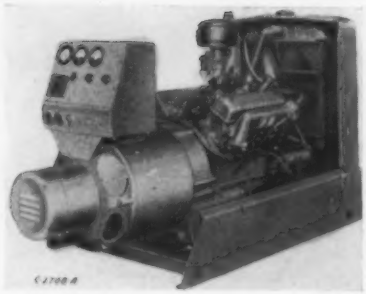
New "E-Z-Red" 100-amp split bus enclosures give room for six double pole breakers. Unit also has ten single-pole branch circuits which are controlled by one of the six double-pole and the remaining five double poles can be used for any five of the following where you need 220-volt service; dryers, range, water heaters, heating panels, air conditioners, etc. This unit may also be had in a four double-pole, with eight single-pole branch circuits. Circuit breakers operation handle has two positions, "on" and "off", and a trip indicator. Breaker is quick make—quick break—trip free—thermal—magnetic type, listed by U. L. It is available in 15, 20, 30, 40 and 50 amps, 120 volts, ac, 120/240 volts ac, 2-wire single-pole. Double-pole breakers can be arranged by the use of "handle ties". Catalog is available.

Wadsworth Electric Mfg. Co., Covington, Ky.

Winding Tool (13)

A small threading tool has been developed to speed winding of small motors. The tool eliminates finger-to-finger threading of small size wires through small bores. Wire is quickly and simply laid in the slots by guiding the tool's tip through the slot. Then the wire which is feeding through the tubular length of the tool is trailed into the slot right behind the tool tip. Each time the wire is looped around the end of the slots, a stiff spring-end on the tool pulls the wire taut in the slot. With this tool, winding time for small motors can be greatly reduced.

Chas. Menge Co., 350 Paterson Plank Rd., Jersey City 7, N. J.



Electric Plants (14)

Two new series, 25EC, 25,000-watt and 35ED, 35,000-watt, of Ford-powered electric generating plants for use in the construction industry and in other fields where independent electric power is essential. The revolving field generators have 2% (plus or minus) voltage regulation and 3-cycle frequency regulation. They are heavy-duty, rated for continuous service. Features include: self-aligning semi-flexible drive disc, drip-proof construction, all-climate insulation, constant pressure brush springs, doublesealed prelubricated ball bearing and automatic voltage regulator. All standard voltages are available for 60-cycle, 1- and 3-phase models. Both of these series of electric plants are available in either fully housed or unhoused models. They are equipped with a metal control box mounted over the generator. Control features include engine instruments, high-water-temperature and over speed shutdowns, ac voltage regulator, field rheostat and ac voltmeter. A circuit breaker and ac ammeter are standard accessories on the housed units.

D. W. Onan & Sons, Inc., Minneapolis 14, Minn.

Maintenance Tester (15)

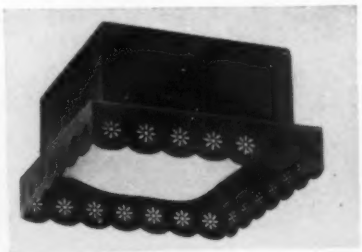
Model 123 maintenance tester checks line voltage, traces continuity in electrical circuits, and tests motor windings with 500 volts for grounds or poor insulation. Line voltages up to 500 volts ac are read on a 4½-in. meter that is fuse-protected against accidental burn-out. Electrical continuity is traced with 6 volts (enough potential to trace a circuit through burned or pitted contacts) and is indicated as good, fair, or poor on a green-yellow-red band scale. The 500-volt ground test shows the condition of motor insulation on the same scale. Unit has 6-ft test leads with slip-on probes for checking circuit in deep control panels, and crocodile clips to make connections while ground testing or manually operating contactors. Powered by a regular 6-volt lantern battery, the tester weighs 12 lbs. in its steel case; and has spare meter fuses.

Slaughter Co., 1700 Nicklin Ave., Piqua 20, Ohio

Local Lighting (16)

A new line of Localites for machine tools, assembly and inspection operations are named the 20th Anniversary models. Increased articulation makes possible directing the light reflector in numerous positions. New universal arm joints with large frictional triple disc bearing surface provide 135° bend. Collar disc joints rotate 180°. Various style reflector assemblies include heavy duty industrial type sockets. Wiring is SPT-2 18/2 heavy duty plastic rip cord. All models are listed by Underwriter's Laboratories, Inc., Catalog is available.

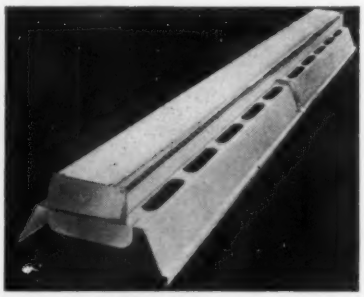
Fostoria Pressed Steel Corp., Fostoria, Ohio.



Incandescent Fixture (17)

A new decorative semi-flush recessed fixture, Model 96, in satin black finish for incandescent installations. Scalloped edge has a lace cutout design. A moulded dropped glass inset evenly diffuses the light. Fixtures are also equipped with reflectors for maximum illumination. Recessed box is of all steel with electrically welded joints. Unit is provided with asbestos heat insulation, and U.L. approved porcelain sockets. Model 96 is available in 60-, 100-, 150-watt bulbs and measures 6¾-in. by 6¾-in., by 4-in., with a 9-in. by 9-in. frame. Atlite catalog is available.

Atlas Electric Products Co., 315 Ten Eyck St., Brooklyn 6, N. Y.



Industrial Fixture (18)

Plantliter is the name of an improved line of industrial fixtures consisting of models in all sizes and for all appplications. It is available as a standard low-cost luminaire with baked enamel finish, or as a certified RLM fixture of approved design and porcelain enamel finish. A new slotted-reflector design with upward component is included in the line, with RLM certification and porcelain enamel finish, or with baked enamel finish. Standard unit is available in 48-, 60-, 72- and 96-in. models with two, three or four lamps. RLM unit is available in 48-, 60-, 72- and 96-in. models with two or three lamps, and the upward-component Plantliter comes in 48-, 72- and 96-in. models for two or three lamps. All luminaires may be joined in continuous runs, suspended on chains, conduit rods, rods and aligners, or flush on ceiling.

Leadlight Fixture Company, 800-100th St., Oakland, Calif.

Industrial Microphones (19)

A new microphone designed for use with communication and automation systems for industry, known as Femco Microphone, MI-2630 Series. It is particularly suited to all applications where the level of ambient noise is a factor or where dust or moisture is prevalent. The frequency characteristic has a slight rise toward the high end and a fairly abrupt drop off after 3500 cycles. Other features include a snap-action switch operated through a rubber diaphragm to a pushbutton; a large eyelet encased in bakelite for ease of hanging; a thick high-impact-resistant bakelite shell at all stress points. Standard switch comes equipped with two normally open contacts and one normally closed contact for almost any switching need. Overall dimensions are 6-in. by 2¼-in. by 1¾-in.

Femco, Inc., Irwin, Pa.

Management called this a luxury until they tried to add a machine

This tool works *knew* about modern distribution systems and circuit breaker protection. But management was never fully convinced.

Instead, they'd settle for another line out of the old switchboard every time a new production machine was added. They did, that is, until now. For now they'd had it. They were *really* overloaded.

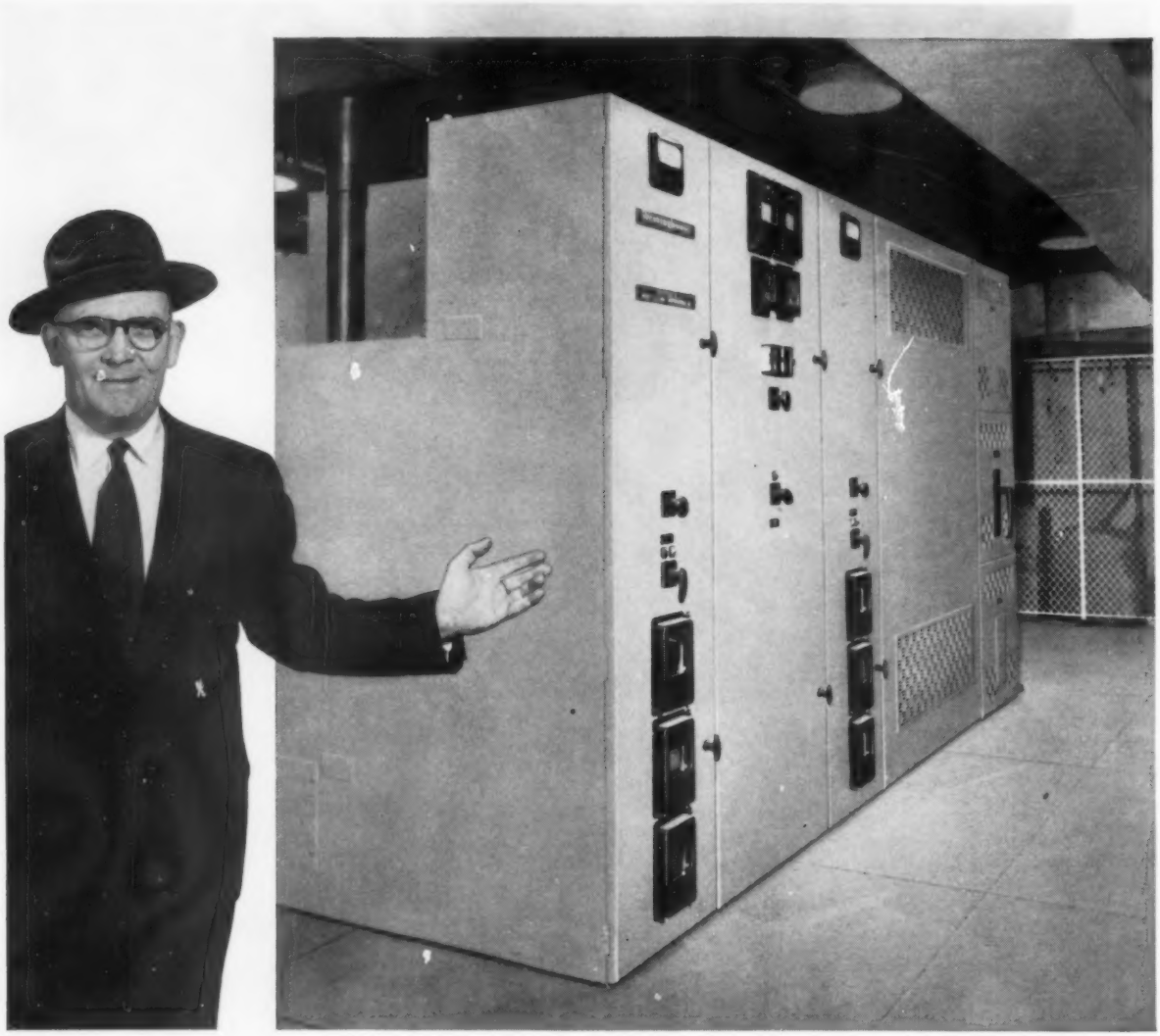
In fact, what management thought was a cost-cutting practice had mushroomed into the most expensive and dangerous heating system ever devised by man.

Either it was a matter of doing something drastic to that electrical system right now . . . or losing a lot more than the units another shaper machine could produce. DP-5011-A

Here's the chain reaction that new machine started →

YOU CAN BE SURE...IF IT'S

Westinghouse



Increased load pointed up the urgency of shortening secondaries with power centers

Power centers, of course, let them carry high-voltage close to the production machines.

Results: Shorter secondaries. Less line losses and voltage drop—conditions urgently needed in this plant.

A power center, I pointed out, contains high-voltage terminals, plus a dry-type transformer and low-voltage circuit breakers. All are in a metal enclosure for safety.

There's no need for a special vault, either. So the power center was mounted over the toolroom. And the money value of the floor space saved may well offset the value of the old switchboard that was replaced. DP-5011-B

YOU CAN BE SURE...IF IT'S

A need for fast machine change-overs proved the economy of plug-in bus duct

Sure. Cable and conduit *could* have been used for the new secondaries in this plant.

But the need for fast change-overs made plug-in bus duct more economical in the long run.

Westinghouse plug-in bus duct, I showed, is a power carrying method you can plug machines into whenever you wish. To change a machine—unplug it. Move down the line. Plug in again. That's all.

And installation costs are low.

Where it might take 56 man-hours to install 400-amp wire and 3-inch conduit, the same amount of 400-amp duct was hung in about 30 hours.

DP-5011-C

Westinghouse

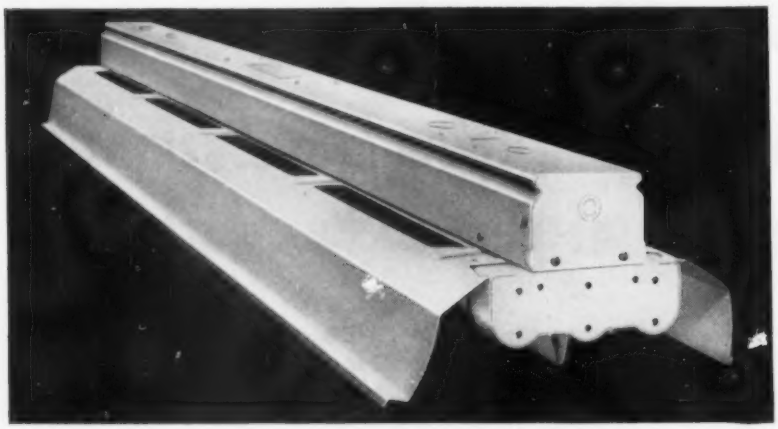
Heavy scrap losses in poorly lit areas sold the efficiency of RLM luminaires

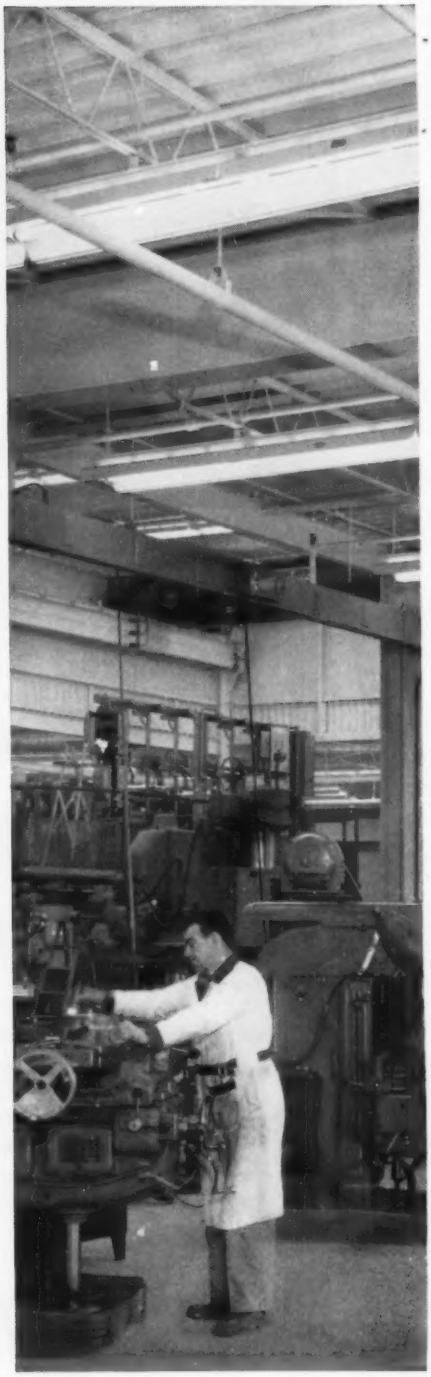
When people see better, they can do better. One look at the poor lighting *and* rejects here helped drive that point home.

As a necessary production tool, I recommended Westinghouse fluorescent upward component luminaires—the new trend in industrial lighting. Over 20% of the light is reflected upward. The ceiling becomes part of the lighting system, thus providing the ultimate in quality industrial lighting.

Results: Highest illumination levels with better distribution, brightness control and shielding. This makes for better working comfort and greater accuracy.

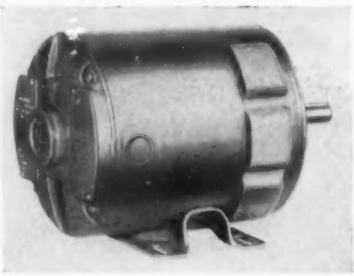
Other pluses: The lightweight, completely wired channels which permit fast installation. The heavy-duty, steel-enclosed lamp holders that eliminate breakage and make lamp replacement easy. DP-5011-D





YOU CAN BE **SURE**...IF IT'S

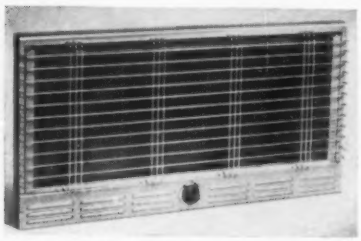
Westinghouse



Motor (20)

A new totally enclosed fractional horsepower motor, especially designed for use on machine tools. Built to meet the demands for frequent start-stop service, the motor has normal torque for starting, high pull-up torque for inertia loads, and high breakdown torque for peak loads. Insulasulation materials of Mylar polyester film, Formex wire, and Glyptal varnish assure resistance to heat, aging, moisture and electrical stresses. In hp ratings of ¼, ⅓, ½, and ¾, the polyphase TEFC motor is available with speeds of 1725/1425 and 1140/950 rpm at 60/50 cycles, and in voltages of 208-220/440, 220/380, and 550.

General Electric Company, Schenectady 5, N. Y.



Radiant Heating Panel (21)

A 1,500-watt radiant glass panel has been developed. It embodies the same construction and performance features of the Berko Select-A-Temp and the Low Boy models, and is built in two styles. Model THC units have a built-in thermostat. Model HC units, for use in rooms where more than one unit is needed, have provision for wall-mounted thermostat control. With either type of installation, they provide closely-controlled heating of individual rooms. New high-output units are built in three power input ranges for 120, 208 and 240 volts. Specially-designed bus bars with multiple carbon contacts make positive connection with the silver terminating edges of the panels. This construction makes it possible to have even distribution of heat over the entire surface of the panel.

Berko Electric Mfg. Corp., 212-40 Jamaica Ave., Queens Village, N. Y.

Capacitors (22)

New 3-, and 5-kvar single phase, 240-volt capacitors designed for power factor correction on secondary distribution circuits. They meet all NEMA standards. Overall height is 13¾ in. for the 3-kvar, and 18⅝ in. for the 5-kvar. Both have a 5-in. diameter. They incorporate solder-sealed bushings and are equipped with two

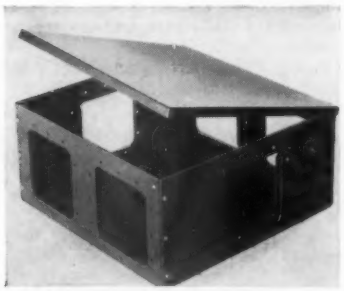
48-in. insulated leads. Terminal mounted fuses are available. Units can be mounted with bushings up or down. They are furnished with either a 2-hole mounting bracket or a standard EEI-NEMA cross-arm mounting bracket. Units have steel tanks protected from corrosion by L-M's new aluminum metallized finish that is covered by a primer and a finish coat of blue-grey alkyd-resin paint.

Line Material Company, 700 W. Michigan St., Milwaukee 1, Wis.

Lighting Fixture (23)

A new incandescent square lighting fixture, combining opal drop glass with trim perforated metal, No. 360. It is surface mounted, measuring 3½ inches from the ceiling. Unit is 9 inches square and available in a choice of three metal finishes, black, brass or triple chrome plated. It accommodates two 60-watt incandescent lamps and has many applications for small and large area lighting. UL approved, the fixture is also available in No. 362 model, 11 inches square accommodating three 60-watt lamps.

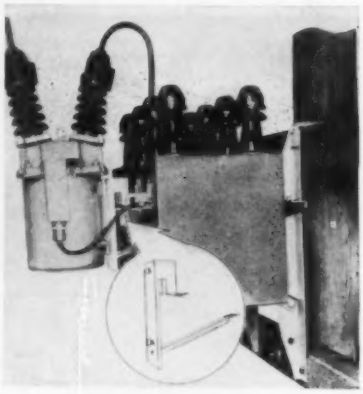
Markstone Manufacturing Co., 2460 W. George St., Chicago 18, Ill.



Pull Boxes (24)

New square pull boxes designed to provide added flexibility in meeting a wide range of wiring layout requirements. Available in two sizes to fit either 4-in. or 6-in. square wireways, the pull boxes can be used for crosses, elbows and junction boxes in double and single run installations, as well as many other applications. The boxes are brake formed from heavy gauge steel with precision formed edges for fast assembly with wireways, and then finished in corrosion-resistant, gray baked enamel.

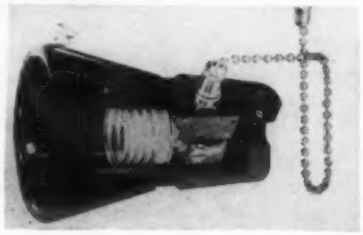
Keystone Manufacturing Co., 23328 Sherwood Road, Center Line (Detroit), Mich.



Capacitor Switch Bracket (25)

A new capacitor switch bracket for converting banks from "fixed" pole-top banks to automatically switched units. Steel bracket enables users to mount type CSO capacitor switches on standard 3- or 4-unit capacitor mounting brackets without removing capacitor units, or lifting assembly from the pole. A complete 3-phase conversion requires only three CSO switches and switch brackets, and a control junction box. The junction box can be included, complete with cables and the female half of a weatherproof connector for connection to the CSO switches.

Westinghouse Electric Corp., P.O. Box 2099, Pittsburgh 30, Pa.



Lampholder (26)

New phenolic lampholders, designated the Levolier 4600 series, feature a flared top to accommodate an inverted glass globe for indirect lighting and is all that is required for 2-circuit operation of 3-light lamps. Flared top accommodates standard 6-in. and 8-in. I.E.S. shades which are held securely by knurled head screws. Base section is fitted with a threaded ⅛-in., ⅜-in. or ¼-in. hole for fastening to lamp stem. One model is available with pull-chain control, other models have pushbutton and plain lever control. It is a 250-watt, 250-volt assembly.

McGill Manufacturing Co., Inc., Valparaiso, Ind.

Motors (27)

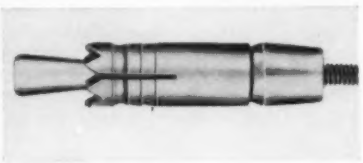
A new line of totally-enclosed, inert gas-filled motors in a wide range of ratings for safe operation in hazardous gas-contaminated areas. Enclosures utilize air-to-water surface heat exchangers to remove heat of motor losses. Provision is made for maintaining an inert-gaseous atmosphere within the enclosure. Under positive pressure, the non-explosive gas inside the motor keeps out volatile ambient gases that could cause an explosion. A gas pressurizing manifold is used to maintain positive pressure within the housing. Other special equipment includes explosion-proof instrumentation for temperature detection, liquid level alarm and water-flow metering. Inert gas-filled enclosures are favored in applications requiring motors of considerable internal volume.

Allis-Chalmers Manufacturing Co., Milwaukee 1, Wis.

Transformer (28)

A new direct burial constant wattage transformer for use on multiple mercury lamp circuits. Transformers are rubber covered and completely sealed from moisture, which can be used for street, highway, parking lot and other outdoor lighting systems. They can be buried in the ground next to the pole base, or they can be placed in the pole base.

Jefferson Electric Co., Bellwood, Ill.

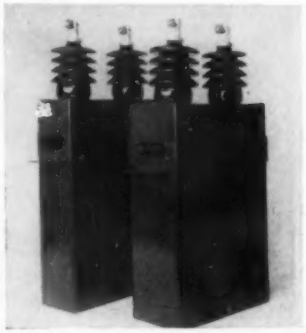


Stud-Bolt Shell (29)

Stud-bolt expansion shell has been added to this line of Bulldog self drilling expansion shells. Available in six standard bolt sizes, the new Series 600 can be installed with either electric or air hammer for all types of anchoring work in concrete and masonry construction. Series 600 shells are complete with expander plug and bolts ready to use. It is for all types of maintenance work, sill and stud installations and fixture and machinery anchoring.

J. D. Polis Manufacturing Co., 2900 W. 26th St., Chicago 23, Ill.

(30)



A 33⅓ KVAR CAPACITOR for power-factor correction. The improved capacitor will provide 300 kvar with nine units. Or, twelve 33⅓ kvar units will expand pole mounted installations to 400 kvar blocks. Manufactured by Cornell-Dubilier Electric Corp., South Plainfield, N. J.

*

Sales Feature . . . **Uniform Heat**

The entire surface of our panel radiates heat.

Sales Feature . . . **Economy**

Efficiency up to 80% means minimum operating cost—makes electrical heating practical for large areas.

Sales Feature . . . **Safety**

No glowing wires or coils—and there's no water needed. PYREX brand glass is strong.

Sales Feature . . . **Cleanliness**

Corning panels don't attract dust—have no combustion waste.

Sales Feature . . . **Comfort Control**

Each room can have the amount of heat it needs right to the degree.

Sales Feature . . . **Fast Heat**

Corning panels radiate infrared rays that convert to warmth fast.

Sales Feature . . . **Silence**

No moving parts.

Sales Feature . . . **Space Saving**

A complete unit need be only 2 or 3 inches deep.

Sales Feature . . . **Easy Installation**

You can design heaters with Corning Radiant Panels for installation with no complicated wiring or wall preparation.

Sales Feature . . . **Pre-Acceptance**

Consumers know that the PYREX trade-mark identifies dependable value. This helps you gain high acceptance with a new product — right from the start—with consumers, dealers, distributors.

PYREX E-C panel's sales features are helping to create wider acceptance for electric heating

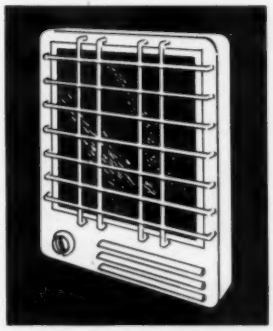
Take all the reasons for having electric heat. Add to them the sales features of the PYREX E-C panel.

You'll have a doubly-impressive collection of features to build demand for electric heat installations in new homes . . . additions . . . expansions . . . auxiliary heating . . . emergency heating . . . and portable heating.

The PYREX E-C panels supply the sales edge in the way they perform. We make them of a PYREX brand glass with a conductive, metal oxide coating bonded to the back surface. They emit infrared energy with a high degree of efficiency. They're mechanically strong and thermally rugged. And their electrical characteristics are excellent. They can be used as high temperature, 2,000- and 3,000-watt units for permanent space-heating installations. Also current surge on starting is low.

To learn all about Corning PYREX E-C Panels and how you can use them to increase the use of electric heating, write, wire or phone Corning Glass Works.

If you are interested in using these PYREX E-C panels as components in new heaters, we'd be delighted to talk it over with you.

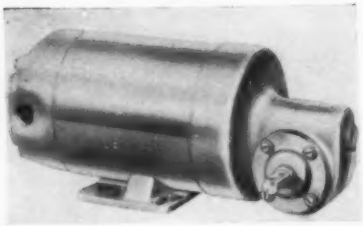


Standard panel sizes: 8" x 36", 12" x 16" and 16" x 24" are available. Other sizes to order.

CORNING GLASS WORKS, CORNING, N. Y.

98 Crystal Street

Corning means research in Glass



Gearmotors (31)

A new line of small gearmotors made in the NEMA 42 frame and offered in 1/20 and 1/12 hp ratings. Eight standard ratios in the range from 5:1 to 60:1 are offered. Motors can be split phase, capacitor start-induction run, capacitor start-capacitor run and polyphase. Both open and totally enclosed constructions are available. Pre-lubricated ball bearings are used. Gear box can be mounted in a number of positions. Provisions have been made for grease seals at both the input and output shafts.

Doerr Electric Corp., Cedarburg, Wis.

Warning Signal (32)

A new warning signal for use on many kinds of moving equipment, including emergency vehicles, diesel switcher locomotives, cabooses, cranes and material handling shop trucks. This safety device may also be used to mark the location of hazardous areas where workmen may be hidden from the view of moving equipment drivers or operators. The beam of the Type PAR-46 sealed beam lamp, used in the new device designated "Type 15360 Gyralite," is reflected at right angles by the dual inclined plane reflector which revolves at 48 rpm and which projects 96 flashes per minute in a horizontal plane. The reflector is mounted directly to the geared motor shaft. A 3-wire terminal block is provided in the base of the signal for the motor and lamp leads. Lamp is accessible through the gasketed hinged door at the top.

Pyle-National Company, 1334 N. Kostner Ave., Chicago 51, Ill.

Protective Device (33)

"Packaged" automatic protection for circuits and equipment. It alarms by red indicating light and howler upon occurrence of abnormal conditions affecting metals, oil, water, air, steam or any gas. Detects high transformer and cable temperatures, motor overload or

starter trip, single phasing or reverse phasing of motor or circuit, abnormal water level, potential fire-producing conditions, etc. Terminal block provides control circuit points for water pump or fire fighting equipment operation or to trip electrical breakers. Trade-named "Safalarm" includes rugged components with hermetically sealed, non-adjustable relays all protected in one metal enclosure. When supervised condition is normal the white pilot light indicates both normality and protected circuit integrity. Any abnormality causes white light to go out and simultaneously the red pilot light flashes off and on continuously. The user's howler, bell or fire gong goes into instant operation and any connected control circuit is also energized. Station operator or engineer acknowledges abnormal condition and silences howler by turning the silence switch. Supply is from any 110-volt, ac convenience outlet.

Stone Boiler Equipment Corp., 186 *Powers St., Brooklyn, N. Y.*

Current Transformer (34)

A new current transformer designed for indoor service and suitable for operating relays and control devices. Designated as Type JKS-3, it has been designed with extra high mechanical and thermal ratings to adapt it for relay and control device operation. It is designed for use on circuits not exceeding 5,000 volts, line-to-line, and is available in all standard, single, primary-current ratings 15 to 800 amps inclusive. Type JKS-3 is butyl-molded, a construction in which the butyl serves as insulating, support and casing. Unit is designed for continuous operation at 100% of rated current in 55° C ambient temperature without exceeding the allowable 30° C rise.

General Electric Co., Schenectady 5, N. Y.

Tape (35)

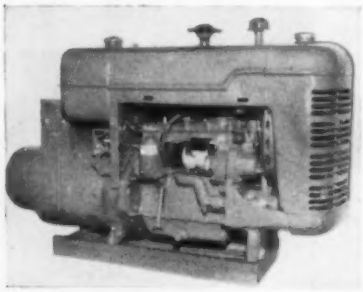
A new high voltage splicing tape for the new ozone resistant power cables operating at higher conductor temperature ratings at 85°C up to and including the 15,000 volt range. Bishop No. 30 is recommended for use on all cables insulated with ozone-resistant compounds and operating at 2000 volts or more. It has superior resistance to the erosive action of both corona and ozone, as well as superior aging properties.

Bishop Manufacturing Corp., 2 Canfield Road, Cedar Grove, N. J.

Safety Switches (36)

A new line of Type "G" safety switches in sizes from 30 to 200 amps. Switches are fusible, single-throw, side operated with visible knife blade construction for ease of inspection and maintenance. Solderless lugs in all devices. Covers are deep-drawn. Numerous knockouts are provided. Switches are sealable in both "on" and "off" positions. Finish is Melamine-base gray enamel.

Murray Manufacturing Corp., 1250 Atlantic Ave., Brooklyn 16, N. Y.



Electric Plant (37)

A new bantam size, water-cooled electric plant of high capacity, designated series 125. Plant has a capacity of 5500-6000 watts. It is powered by a 4-cylinder, 4-cycle L head engine which operates at 1800 rpm. Unit comes complete and fully self-contained ready for operation. It includes centrifugal type governor, high tension magneto ignition system and mounted fuel tank. Heavy-duty generator is rated at 5500 watts continuous service and 6000 watts intermittent service. It is available in all voltages, ac. Choice of five types of control—manual starting, electric starting, remote control, fully automatic control and emergency automatic. Bulletin is available.

Universal Motor Company, 534 Universal Drive, Oshkosh, Wis.

Controls (38)

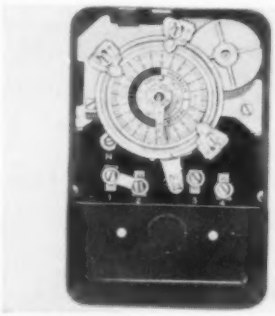
New L-M Tabet photoelectric relay controls have an improved circuitry design that features a reduction in the number of amplifying tubes from two to one. The T3000 series control is primarily designed for direct load applications; but it can also be used for remote control applications. Installed in a standard watt-hour meter case, this control is available with 3000-watt single-pole, double-throw or 2500-watt double-pole, single-throw load contact ratings. The T5000 series is designed for remote and direct control applications. It is a self-contained surface mounted control and can be either pole or crossarm mounted. This control is available with 1000-watt single-pole, single-throw load contact rating. Both control series are available for 120-volt, 60-cycle, while T-3000 series is also available for 240-volt, 60-cycle.

Line Material Company, Milwaukee 1, Wis.

Cable Puller (39)

The capacity of this combination tape pushing and wire pulling machine has been stepped up to handle most 2½-in. and 3-in. runs. Another improvement is a new coupling which will permit direct attachment of the puller to conduit in old type installations where the conduit is close to the back of the junction box. This improvement now makes it possible to use the puller in any cabinet where a bushing can be attached to the conduit. The new close conduit coupling will be available for all Barth cable pullers now being manufactured as well as for all units now in field operation.

Barth Corporation, Cleveland, Ohio

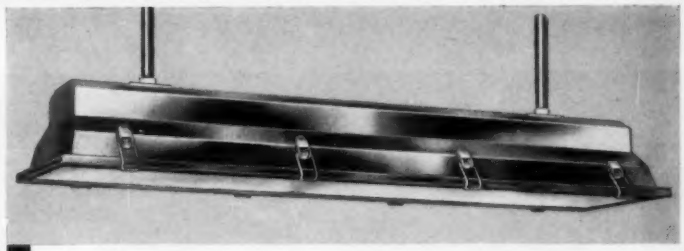


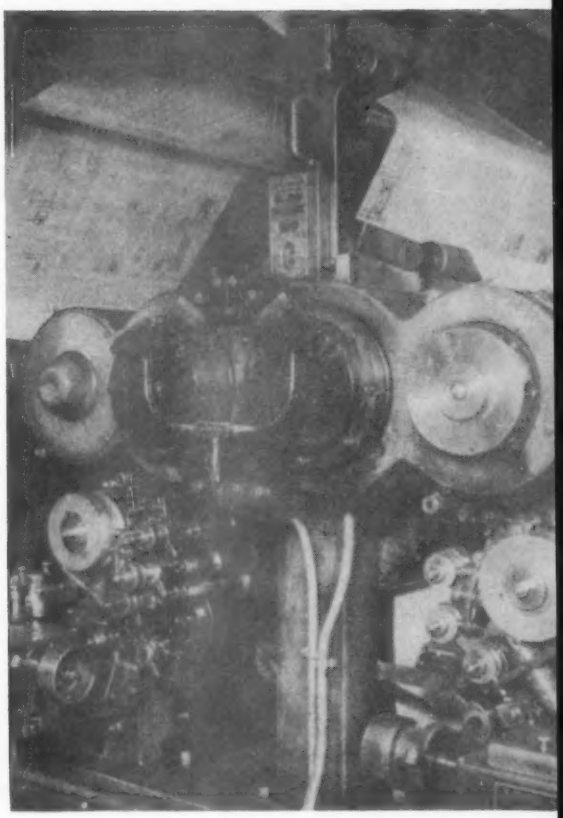
Time Switch (40)

New improved Intermatic T670 series time switches are recommended for controlling commercial refrigeration defrosting, automatic poultry feeders, industrial process timing, and wherever the time

engineered lighting

for hazardous and specialized locations





Wheeler VAPOR TIGHT

These specialized Wheeler fixtures combine superior lighting efficiency with extraordinary resistance to moisture and vapors. Insurance against costly product spoilage from lamp breakage or falling lamps is provided by the heavy cover furnished with each of these carefully engineered units. Equipped with plain clear glass, or with tempered plate glass where required to withstand shocks and impacts.

USES

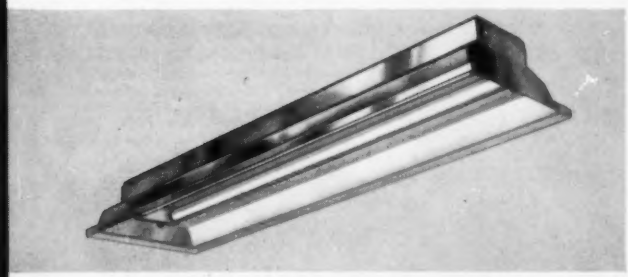
- PRESS ROOMS
- FOOD PLANTS
- LAUNDRIES
- MEAT PACKERS
- DYE HOUSES
- CAR WASH GARAGES
- BOTTLING PLANTS

Wheeler "SERIES II" DUST-TIGHT

Fully comply with all Underwriters' requirements for installation in Class II, Group G, Class II, Group F and Class III locations. These hazardous locations involve the presence of atmospheres containing combustible dusts or ignitable fibers or flyings.

USES

- GRAIN ELEVATORS
- SUGAR MILLS
- WOOD-WORKING PLANTS
- WAREHOUSES
- BOILER ROOMS
- MINES



Wheeler TEXTILUME

One-piece construction and seamless porcelain enamel finish makes these specially designed units ideal for textile mills or any other industry where severe moisture and humidity conditions exist. Engineered for long, trouble-free service. Accessory glass covers available.

USES

- TEXTILE MILLS
- PAPER MILLS
- TANNERIES
- RUBBER PLANTS
- DAIRIES

Wheeler REFLECTOR COMPANY

275 Congress Street • Boston, Mass.

DISTRIBUTED EXCLUSIVELY THROUGH ELECTRICAL WHOLESALERS

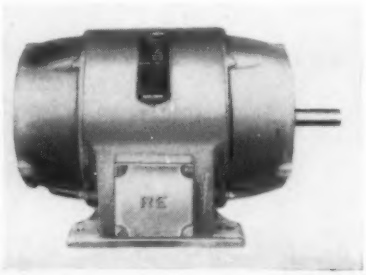
cycle desired is one hour or less. They permit as many as 14 different "on-off" cycles a day, all on one dial and each cycle individually adjustable for timings from 5 to 60 minutes. Available in 125- or 250-volt models, they can be used as three different switches: single pole, single throw—contacts normally closed; single pole, single throw—contacts normally open; single pole, double throw—alternating contacts. Switches are housed in drawn steel cases, measuring 7¾-in. high, 5-in. wide, 3-in. deep, and light gray in color. Bulletin No. NR-105 is available.

International Register Co., 2624 W. Washington Blvd., Chicago 12, Ill.

Outlet Box Locater (41)

The new Model 6-W Plaster-Eye electronic outlet-locator provides a quick and accurate way to locate outlets which have been plastered over or otherwise covered during building construction. Unit will indicate exact location of outlets buried as much as 2 inches deep in plaster, concrete, etc. In use the button on top the unit is depressed and the front end of the instrument passed over the area to be searched. The indicating needle swings sharply over when centered on the concealed outlet box. A zero control permits the use to balance out the effect of metallic lath when encountered.

Plaster-Eye Company, 2650 Noblestown Rd., Pittsburgh 5, Pa.



Motor (42)

New "Xpandable" basic motor design permits many single-frame combinations of motors, brakes, fluid-couplings and gear reducers. Combinations are achieved through the use of standard, interchangeable Reuland assemblies and result in space-saving power packages. Alignment problems are eliminated and installation time is reduced through single-unit,

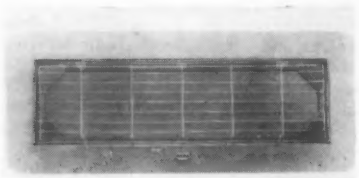
"package" mounting. "Xpandable" power packages are available in many hundreds of single frame combinations with different mechanical and electrical characteristics. Ratings from ½ hp through 15 hp.

Reuland Electric Co., Alhambra, Calif.

Fittings (43)

A complete line of auxiliary flangeless wireway fittings designed to assure maximum flexibility in meeting wiring layout requirement. The line includes flangeless "T" fittings, 90° elbows, and pull boxes, 45° elbows, closing plates, "U" connectors and panel adapters. All are available in a complete range of sizes for use with 2½- by 2½-in., 4- by 4-in., 4- by 6-in., 6- by 6-in., and 8 in. by 8-in. Keystone flangeless wireways. They are finished in corrosion resistant, baked gray enamel. Catalog is available.

Keystone Manufacturing Co., 23328 Sherwood Rd., Center Line (Detroit), Mich.



Electric Heaters (44)

A new line of electric radiant glass heaters includes a portable unit, surface and recessed mounting wall panels and a baseboard panel. Portable units are equipped with power cord for connection to 120- or 240-volt receptacle. Wall and baseboard panels are designed for permanent connection to the electrical circuit, at 120 or 240 volts. Both built-in and separate thermostats are available. All units have aluminum-in-glass elements.

Can Arm Corp., P. O. Box 30, Chazy, N. Y.

Pressure Controls (45)

Fireye 80B pressure controls are designed for many industrial uses. They provide high and low limit control for steam, air and non-corrosive liquids and gases. They may be used wherever it is desired to start or stop operations at pre-set maximum or minimum pressures within the range of 3-in. vacuum to 240 psig. On heating installations they may be used for high limit safety or to maintain steam pressure within set limits. Controls open contact on pressure rise, shutting down operation when pilot or main gas line pressure reaches a pre-set safe maximum value. Auxiliary relays may be used to reverse the action of any of the new controls. Calibrated dials indictate operating and differential settings. Bulletin CO-30 is available.

Combustion Control Div., Electronics Corporation of America, 718 Beacon St., Boston 15, Mass.

Product Briefs

(46) A giant 20-in. 2-speed window **exhaust fan** has been announced by Precision Equipment Co., Chicago, Ill. . . . . (47) A new 10-in. suspension **insulator**, in the EEI-NEMA class 52-3, is being manufactured by Illinois Electric Porcelain Company and distributed by Line Material Company, Milwaukee, Wis. . . . . (48) The Bar-Brook Mfg. Co., Inc., Shreveport, La., has added the AVP-30 package unit **attic fan** to its line.

(49) Foote Bros. Gear and Machine Corp., Chicago, Ill., has announced new "Line-O-Power" **speed reducers** with capacities ranging from fractional hp to 150 hp.

(50) Unistrut Products Company, Chicago, Ill., has announced new, low-cost lightweight, all-purpose metal framing designated "A" series **channel and fittings**. . . . . (51) Six new driQuik infrared interlocking **oven sections** for all industrial baking, drying, dehydrating, pre-heating, degreasing, curing and other applications have been introduced by the Dry Clime Lamp Corp., Greensburg, Ind. . . . . (52) A low-power industrial **2-way radio system**, known as "Carfone-150", specially designed for the requirements of materials-handling vehicles has been announced by the Radio Corporation of America, Camden, N. J.

(53) A new line of Finnflex "Floating Pillow" **vibration mountings** for medium and heavy weight machinery has been developed by T. R. Finn & Company, Inc., Hawthorne, N. J. . . . . (54) International Rectifier Corporation, El Segundo, Calif., has developed new Germanium **power rectifiers**. . . . . (55) A new **switch** designed with illuminated pushbuttons has been announced by Micro Switch, Freeport, Ill.

(56) A new **shuttle-car cable** with greatly increased life has been announced by the Anaconda Wire & Cable Company, New York, N. Y. . . . . (57) A new galvanized alloy **staple**, known as "Galalloy", has been developed by Arrow Fastener Company, Inc., Brooklyn, N. Y. . . . . (58) Jefferson Electric Company, Bellwood, Ill., has introduced a new line of **transformers** for machine tool control panels.

(59) Three variations of a standard electronic level and flow **detector and controller** have been developed by the Fielden Instrument Div. of Robertshaw-Fulton Controls Co., Philadelphia, Pa. . . . . (60) Six new **bender dies** have been introduced by Hossfeld Mfg. Co., Winona, Minn. . . . . (61) "Spee-D-Hak" is a new lightweight portable **hack saw** that will cut any metal from cold rolled steel to electrical conduit. It is manufactured by NBC Engineering Co., Kaukauna, Wis.

(62) New Inmanco "Mylar" lined formed fibre **wedges** have been developed by Insulation Manufacturers Corp., Chicago, Ill. . . . . (63) New 7.5-, 15-, 34.5-, and 69-kv switch and bus **insulators** of the cap and pin type design are being distributed by Line Material Co., Milwaukee, Wis.

CATALOGS and BULLETINS

(64) ELECTRICAL TAPES. New 2-color catalog describes the complete line of rubber, friction, and plastic tapes for a variety of applications. Accurate Manufacturing Company.

(65) LIGHTING FIXTURES for residential and commercial installations include Circlines, Channelites, recessed units and lanterns. 24 pages. Markstone Manufacturing Co.

(66) ROOF VENTILATORS. Catalog A-112, 12 pages gives specifications, dimensions and performance data on the complete line including two new models; the Vertijet and the Stack Cap. Hartzell Propeller Fan Co.

(67) OFFICE LIGHTING UNIT called the Budgetlite is designed to afford maximum efficiency with minimum investment. 4 pages. Ainsworth Lighting, Inc.

(68) V-BELTS. Construction of several styles, including link type belts is detailed along with complete selection data for new installations and replacement use. 24 pages. Maurey Manufacturing Corp.

(69) OUTDOOR RESIDENTIAL LIGHTING methods are pictured in a 28-page booklet giving the equipment available for various conditions and some unusual ideas for illuminating different outdoor areas around the home. General Electric Co.

(70) SERVICE ENTRANCE EQUIPMENT for 3-wire, 60- and 100-amp installations are available with up to four fuse puller units and 20 plug fuse circuits. Booklet GEA-6286, 16 pages, gives construction features, dimensions and wiring diagrams. General Electric Co.

(71) SOUND SYSTEMS for industrial plants are described in a 12-page booklet covering various applications of the equipment and the benefits to be obtained. Form 3R2478. RCA Engineering Products Div.

(72) SCHOOL LIGHTING and electrical facilities are discussed in 31-page Booklet B-6521 designed for educators and administrators. Lighting is covered with respect to requirements in each area and available types of equipment. The section on wiring systems emphasizes performance, safety, flexibility. Westinghouse Electric Corp.

(73) MOTOR CONTROLS for air conditioning, pump, heating and ventilat-

ing equipment are the subject of 42-page EC-80. The complete line of starters and pilot switches are detailed as to applications, operation and features. Cutler-Hammer, Inc.

(74) HIGH FREQUENCY HEATING. Four new bulletins: 12-page bulletin 1441 covers 5-, 10-, 25-, and 50-kw induction heating units and accessories; 4-page 1480 covers high frequency M-G sets for this purpose; controls are described in bulletin 1460; and a 3-kw hf unit employing a heavy duty vacuum tube converter is discussed in booklet 1470. Lindberg Engineering Co.

(75) SPEED REDUCERS for straight line and right-angle drive applications are listed for a wide range of mounting and load conditions in ratings up to 147 hp. Complete selection method and all necessary information is included in 40-page Manual LP-3. Foote Bros. Gear & Machine Corp.

(76) WIRE AND CABLE for railroad installations are itemized in a 90-page booklet which also lists insulation compounds, tapes and information on messengers for aerial cables. United States Rubber Co.

(77) STORAGE EQUIPMENT. Steel racks and bins particularly suited to contractors' needs are illustrated in 16-page catalog 702 which includes several compact, sturdy units for storing conduit, cable, fluorescent fixtures and small parts. Frick-Gallagher Mfg. Co.

(78) MOTORS of the totally-enclosed and explosion-proof type are detailed in bulletin 1879 which includes accurate cut-away drawings that illustrate construction features such as the pre-wound stator core, asbestos protected windings and Lubriflush lubrication. U. S. Electrical Motors Inc.

(79) PORTABLE CORDS. Rubber-jacketed, Neoprene-jacketed, and cured-in-lead Neoprene-jacketed cords are described as to construction and range of applications in information-packed, 8-page bulletin DM-5538. Anaconda Wire & Cable Co.

(80) FIRE DETECTOR operates on thermostatic principle, provides two levels of heat-actuated circuits plus a third circuit for cold protection. Form D-100, 4 pages. Bruhn Detect-O-Stat Co., Inc.

(81) DISTRIBUTION EQUIPMENT. Two publications: GEC-1031, the 1955 Quick Guide, contains prices and brief descriptions of products primarily used in residential, light commercial and industrial installations; the General Catalog, GEC-1032, is a complete compilation of prices and technical data of the entire line including busway,

panel and switchboards, control centers and theatre lighting controls. Distribution assemblies Dept. General Electric Co.

(82) SCHOOL LIGHTING is discussed by Dr. Darell B. Harmon in a new 40-page brochure. He approaches the subject from the standpoint of the classroom experiences, other than recognition of detail, that contribute to learning and visual requirements of each of these tasks. Wakefield Co.

(83) DOMESTIC HEATING CONTROLS are illustrated and described in a 16-page Buyers Guide that includes prices, ratings, dimensions, and information on the G. E. service plan. GEC-1030. General Electric Co.

(84) FLOODLIGHTS in elliptical or parabolic shapes are designed for aluminum pole-top mounting; will accommodate 300- to 1500-watt incandescent or 400-watt mercury vapor lamps; are available in porcelain or anodal aluminum finish. Bulletin 1074, 2 pages. Steber Manufacturing Co.

(85) SHERARDIZING process of galvanizing conduit is illustrated in a new booklet which includes tables of conduit dimensions and weights. National Electric Products Corp.

(86) PROTECTIVE CONTROLS. Three bulletins: The 12-page GEA-6331 booklet describes construction and operating features of high voltage, current limiting fused starters called the Limitamp; secondary network protection equipments such as circuit breakers and relays are detailed in 28-page GEA-2017E; and current limiting fuses rated at 250-volt and 600-volt in sizes from 6 to 200 amps are covered in GEA-6319, 8 pages. General Electric Co.

(87) MARKERS for wire are available with a wide range of notations, are imprinted on pressure-sensitive tape that is virtually unaffected by heat, cold or vibration; 8-page catalog. Similar markers designed for pipe identification are listed in a separate 4-page catalog. North Shore Nameplate Inc.

(88) MOTOR AND DRIVE. Bulletin GEA-6280, 12 pages, illustrates design and performance characteristics of new vertical motor for pumping applications; available in sizes ranging from 7½ to 500 hp. Thy-mo-trol adjustable-speed drives are detailed in 8-page bulletin GEA-6234 which emphasizes their simplicity and economy of operation. General Electric Co.

(89) PLASTIC COATING is sprayed on equipment surfaces to protect finishes, later peeled off at job completion. Folder M-3, 4-pages, illustrates uses of this technique. Spraylat Corp.

(90) ELECTRIC HEATING manual describes a complete line of radiant glass wall and portable heaters. Technical information such as heat loss determination, climatic data tables, and utilization factors for various types of construction are presented in its 28 pages. Can Arm Corp.

(91) POWER PLANTS for portable and standby applications are available in flat-compounded dc models rated to 5 kw designed to deliver constant voltage regardless of load. Multi-Matic Corp.

New Books

Principles of Electric Utility Engineering (92)

A concise source of information on utility operations for the contractor doing work for power companies. While not essentially a reference, the book is so indexed as to serve this purpose. By Charles A. Powel. Technology Press of M.I.T. and John A. Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. 251 pp. $6.00.

Home Wiring Handbook (93)

A comprehensive guide to proper design of the residential electrical system, this fourth edition provides information on load requirements, circuit and service layout, plus dimensions of standard appliances and basic operating principles of newer devices. A sample specification for a one-family home is also included. By A. Carl Bredahl. Westinghouse Electric Appliance Div., Mansfield, Ohio. 142 pp. $1.00.

Lighting the Stage (94)

This non-technical book is designed to give the reader a concept of the effects which can be obtained from the various types of stage lighting equipment. As such, it gives the electrical man a firm background in design and utilization within this special field of illumination. By P. Corry. Pitman Publishing Corp., 2 West 45th St., New York 36, N. Y. 157 pp. $4.50.

Storage Batteries (95)

The fourth edition of this general treatise on the physics and chemistry of secondary batteries and their engineering applications contains new information on improved lead alloys to withstand corrosion, increased use of lead calcium alloys and uncalcined high-metallic oxides and other recent developments of importance in the field; includes 45% new illustrations. By George Wood Vinal. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. 446 pp. $10.00.

Magnetic Control of Industrial Motors (96)

Adjustable voltage and regulating systems, especially rotating and magnetic amplifiers, are among the new materials included in the second edition of this comprehensive reference. Starting with discussion of the external performance characteristics of all types of industrial motors, the author then covers available control components and devices, also basic circuits which obtain performance required for industrial drives. By Gerhart W. Heumann. General Electric Series. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. 714 pp. $9.50.

Electric Heating for Home Guide (97)

Latest information on designing, cost estimating, and installing electric heating systems is included in this revised edition. Featured is a case history taking the reader step-by-step through the design of a typical installation.

Those concerned with the design and installation of electric heating systems may obtain the booklet (B-3768-B) from their local Westinghouse apparatus sales office. Westinghouse Electric Corp., 401 Liberty Ave., Box 2278, Pittsburgh 30, Pa. 32 pp. $2.00.

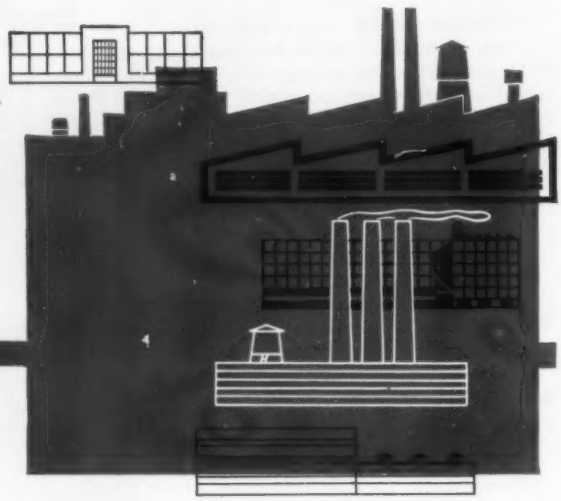
Bryant Guide to the All-Electric Home (98)

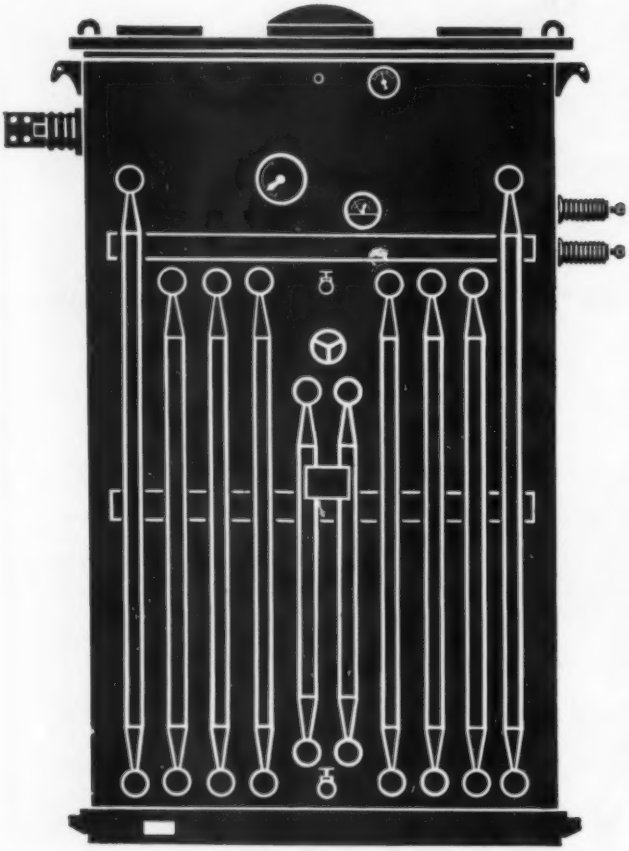
A non-technical roundup designed to familiarize the prospective home builder with the electrical needs of the modern home. Wiring devices, including the low-voltage Multi-Control system, are described as to their function. Other important features are a discussion of recommended standards for each living area of the home and tables of wattage ratings of fixed and portable appliances. Bryant Electric Co., Bridgeport 2, Conn. 24 pp. $.10.

Professional Engineering Registration Laws (99)

A compendium of legal requirements for professional engineers in the 48 states, Alaska, Hawaii, Puerto Rico, and the District of Columbia. Such details as temporary permits, fees and bonds, certificate applications, education requirements, examinations, and public works projects are covered. Laws are cited for reciprocity, renewals, corporate and partnership practice. Project was sponsored by the National Society of Professional Engineers. By Alfred L. McCawley. Trustee Publication Fund, Jefferson City, Mo. 614 pp. $8.75.

KUHLMAN *SAF-T-KUHL* TRANSFORMERS GIVE SAFER, LOWER-COST PERFORMANCE





Kuhlman Saf-T-Kuhl Transformers are filled with a patented synthetic cooling compound that is equal or superior to oil in di-electric strength, fluidity and thermal capacity. Yet the coolant is inert, non-explosive, non-inflammable and it will not sludge. The advantages of any unit employing such a coolant are well known.

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- Maintenance costs are lower because the coolant does not require filtering or reconditioning.
- Insurance rates are lower in most states because Saf-T-Kuhl Transformers are absolutely safe and fireproof.

Saf-T-Kuhl Transformers are especially engineered to meet the requirements of heavy duty industrial service. The entire insulation structure is coordinated with the basic impulse level. Assemblies are thoroughly dried, and the coolant is introduced under vacuum to prevent entrapment of air and insure high insulation strength. Large ducts permit free circulation of the coolant to eliminate the danger of hot spots. Tanks are completely sealed. Cover and bushing gaskets are made from a special cork and synthetic rubber compound that gives exceptionally long life.

Kuhlman Saf-T-Kuhl Transformers are produced in a wide variety of single and three phase ratings. For complete information, write today for Bulletin CS-501. Kuhlman also manufactures, Power, Distribution, Dry Type, Subway, CSP and Series Street Lighting Transformers. Ask for bulletins on these units as well.

154-T

KUHLMAN

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Reader's Quiz

QUESTIONS from readers on problems of industrial equipment, installation, maintenance and repair. Answered by electrical maintenance engineers and industrial electrical contractors out of their experience. For every question and every answer published we pay $5.00.

Required Size of Pump Motor

QUESTION J28—At present a 15-hp gasoline engine is pumping water from a well for spraying a commercial garden. What size electric motor is required to do the same job of about 300 gallons per minute? Motor type and hp will be appreciated and it must be single-phase.—M.B.

ANSWER to J28—There is a formula for determining the horsepower required to pump a certain quantity of water. This formula is precise but it entails considerable calculation and involves too many variables for a problem such as this. The formula is as follows:

$$HP = \frac{G \times H}{3960 \times \text{eff.}}$$

Where: G = gallons per minute of water to be delivered
H = sum of the static and friction heads expressed in feet where:

the approximate friction head =

$$\frac{\text{pipe length (ft.)} \times (\text{velocity of flow})^2 \times .02}{5.367 \times \text{diameter (in.)}}$$

eff. = efficiency of pump usually .50 to .85

This formula then gives the horsepower required which must be converted to an electric drive motor. However, there are variables in the type of pump, size and working condition of the pump plus the condition of the pipe in the well which must be considered in the overall efficiency.

More simply, however, than calculating the requirements, it can be assumed that the pump, the gasoline engine and any frictional losses in the well casing make the entire unit 50% efficient. Then the electric motor required to drive the pump would be a 7½-hp motor requiring circuit protection for approximately 100 amps. Furthermore, if it is known that the existing unit is in good condition, the efficiency can be raised to 75% or 80% which would then require a 10-hp motor for single phase service and higher circuit protection. The circuit protection mentioned is at 120 volts.

Another point which can influence the selected electric motor would be to select a motor using the available nameplate data and efficiency of the pump. Therefore the proper size and type of motor would be either a 7½-hp or 10-hp motor at 120 volts and either a repulsion start-induction motor for constant speed or a split-phase or capacitor-start type motor.—J.B.K.

ANSWER to J28: As a general rule one would use a smaller electric motor for water pumping than would be used for a gasoline engine. No fixed rule can be applied, but generally a 7½-or 10-hp electric motor would be adequate for a pumping job using a 15-hp gas engine.

The exact size of electric motor would depend on the lift and pressure as well as the gallons per minute of water that is pumped. A formula for hp is expressed as:

$$Hp = \frac{GPM \times H}{3{,}960 \times \text{efficiency}}$$

where GMP = gallons per minute pumped
H = total head in feet.
Efficiency is the mechanical efficiency of the pump.

The head includes both static lift head, the discharge pressure, and the friction head. Lift head is the distance in feet the water must be raised when the pump is running. The discharge pressure in feet is the pounds per sq in. x 2.3. The friction head is the friction resistance to flow of water in the pipe. For your case I would assume the friction head to be negligible, as you are probably not pumping through much pipe. Thus as an example, assume the lift is 50 ft and the discharge pressure is 20 lb per sq in. (psi). Then total head is 45 plus (20 x 2.30) or 45 plus 46 = 91 ft. Efficiency will vary with the pump but can be assumed at 70% or 0.7 as an average figure. Then:

$$HP = \frac{300 \times 91}{3{,}960 \times 0.7} \quad 9.85$$

Thus a 10-hp motor should be used for this set of conditions. If pump discharges into air or into an open tank, then of course the discharge pressure would be zero. Another thing to watch for is the drop in water level when pumping a well. Thus water may rise to, say, 45 ft of the surface, but when pumping the level might drop to, as an example, 90 ft. This drop is known as the "drawdown" of the well and will depend upon local water table conditions.

As for the motor type, you specify that it must be a single-phase motor. A motor of this size would probably be a repulsion-induction type motor. A drip-proof or weatherproof motor should be used.—L.R.B.

Temperature and Type TW Wire

QUESTION K28—I understand type TW wire above 4/0 is not allowed in conduit due to cold flow of the thermoplastic insulation. Has any reader run a test and found that it is really dangerous to use these large cables in conduit?—H.S.

ANSWER to K28—Type TW wire is a moisture-resistant thermoplastic wire suitable for general use and wet locations and a maximum operating temperature of 140°F. The term thermoplastic means that it can be softened by heat, therefore, the maximum operating temperature must be strictly adhered to especially if eddy current losses and high resistance contacts are prevalent. On the other hand, temperatures below 14°F. cause the thermoplastic insulation to become stiff and hard thereby being subject to punctures, cracking and deformities from pressure encountered in conduit bends, points, bushings and points of support.

Our company has made extensive studies and tests in this type of cable and the results dictate limited use as to size of wire far smaller than 4/0 and no exterior runs of this cable at the present time. Although single conductor thermoplastic wire has been sanctioned for outdoor secondary current circuits.—J.B.K.

Varnish Treating High-Voltage Motors

QUESTION L28—Do manufacturers of large size high voltage motors, 2300 to 4160 volts, generally varnish after the motor has been wound or is it sufficient to varnish the coils before they are put into the motor?—E.S.H.

ANSWER to L28—Motors emphatically should be painted with a good baking varnish, either dipped or sprayed on. Sprayed on is the best (two coats). 1201 Red Glyptal or 1235 Black Glyptal is put out by General Electric.

This varnish should be baked on. If you do not have an oven, you can bake it on with a 300-watt lamp on each side of the winding, or even better, rotate it during baking to insure uniform finishing—J.P.

Reconnecting Motor for Speed Change

QUESTION M28—I have a 3-phase 440-volt, 50-hp induction motor with a speed of 1750 rpm. How can I reconnect it to run at 1125-1150 rpm?—D.H.N.

ANSWER to M28—Various changes may be made to an induction motor by changing connections. However, a 3-phase induction motor which operates at a speed of 1750 rpm or thereabouts, allowing for a certain percent of slip, cannot be reconnected to run at a speed of 1125-1150 rpm. The reason for this is an induction motor which is wound for a speed of 1750 rpm. has four wound poles and using the formula for revolutions per minute, it will be found that:

$$RPM = \frac{120 \times F}{P}$$

RPM — Revolutions per minute
F — Frequency of power lines
P — Number of poles in motor winding

It will be found that a speed of 1750 rpm will be acquired with a four pole motor winding and a speed of 1125-1150 rpm will be acquired with a 6-pole motor winding. As is clearly illustrated by the above formula, it is not possible to reconnect an induction motor that operates at 1750 rpm to operate at 1125-1150 rpm or any other speed, unless the winding is completely redesigned and rewound.—H.E.R

ANSWER to M28—D.H.N. in his question regarding the change in speed by reconnecting the old winding of a 50-hp induction motor did not give the necessary winding data. To plan a new connection it is necessary to know the number of coils, circuits and type of connection of the present winding.

However, in a case such as his, it is a good policy to dispose of the motor and purchase either a new or used motor with the proper operating characteristics. To quote a well known authority on motor winding, "Speed changes are fraught with difficulties."

Two main obstacles to a successful speed change by reconnecting are the present coil span which will not be right for a different number of poles, and the cross section of the end rings on the rotor which cannot be successfully changed to give proper starting and running torques.

Voltage changes are practical and usually can be easily accomplished if the number of coils, poles and circuits are right for the desired change, but speed changes are seldom satisfactory.—J.A.

ANSWER to M28—This is a 4-pole

Just Screw Them On -

Like a Nut on a Bolt!

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The Easiest Way to Make FAIL-PROOF, FOOL-PROOF PIGTAIL SPLICES

Just by screwing on an IDEAL "Wire-Nut" Connector — finger-tight — you get a gripping action so powerful that you'll break the wire before you can pull apart the splice! No connector grips tighter or holds longer.

But with "Wire-Nut" Connectors you get much more than that. You get a perfectly *protected* splice — with prefabricated insulation that never varies, can not short out, come loose or fail with age. The specially formulated, precision molded phenolic shell on a "Wire-Nut" Connector withstands 4000 volts dielectric and air gap tests — completely covers all bare wire — can not be pierced by sharp wire ends. Its compact size is easy to work with — "fits" better into close quarters.

Because IDEAL "Wire-Nut" Connectors make fail-proof, fool-proof splices easier, millions *more* of them are used for pigtail splices than any other type of connector — with conduit, non-metallic sheath, armored cable and open wiring. Get them and use them on all your wiring jobs.

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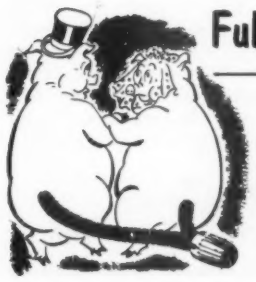

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motor with 12 coil groups, 4 groups per phase. The motor could be reconnected for 18 coil groups or six groups per phase and would then run at the 1150 rpm speed. However, since these coils were wound for a 4-pole motor, their span is approximately 90 degrees of the motor circumference, and reconnecting for 6-pole duty could be done only at a sacrifice of efficiency. If the load is approximately 50 hp at the new speed, the motor will overheat. But if the load is 40 hp or less, good coil can be expected.—E.A.McF.

Can you ANSWER these QUESTIONS?

QUESTION V28—Can a ½ hp, 3-phase, 3450 rpm, 220-volt motor be reconnected to run 220 volts, single phase? I have just tried it by using two groups for the starting, series the other two of each groups for the running, but it is slow on the start. What capacity should be used?—C.H.

QUESTION W28—On one of our planographs we have a universal tracer motor which has been completely rewound recently. Shortly after it was reinstalled we learned that it only ran on half speed when switched on reversed rotation. Since this defect had never been observed before it had been repaired, what might cause the trouble?—O.P.

QUESTION X28—We have a number of 75- and 100-kva lighting transformers around our plant. Eventually the oil becomes sludged and will burn up the transformers or it will go to ground. The transformers are located in difficult places to change and in most cases, the service should not be interrupted for very long. We want to know if someone has a good method to filter the oil while the transformer remains in operation.—F.F.

QUESTION Y28—In a service feeding one lighting circuit and ¾ hp air compressor plus three neon transformers for sign lighting, can corrosion and a slightly loose connection cause only one light of the lighting circuit to light? There are six other lights on this circuit. However, only the one closest to the main service box lights. The air compressor and neon sign transformers were in no way affected.—J.B.K.

PLEASE SEND IN YOUR ANSWERS BY SEPTEMBER 15

FIRST IN THE FIELD

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INDUSTRIAL UNDERFLOOR RACEWAY

APPROVED BY UNDERWRITERS' LABORATORIES, INC.

The Heavy-duty System for Modern Plant Wiring

National Electric JUMBODUCT offers industry three times the capacity previously available, freedom from the hazards of overhead wiring, *plus* outstanding economy. It's designed to provide readily accessible electrical distribution for industrial locations at a minimum investment.

You'll find a JUMBODUCT specification means:

Plenty of Capacity

4″ x 4″ cross section provides adequate room for electric wiring to banks of heavy production equipment.

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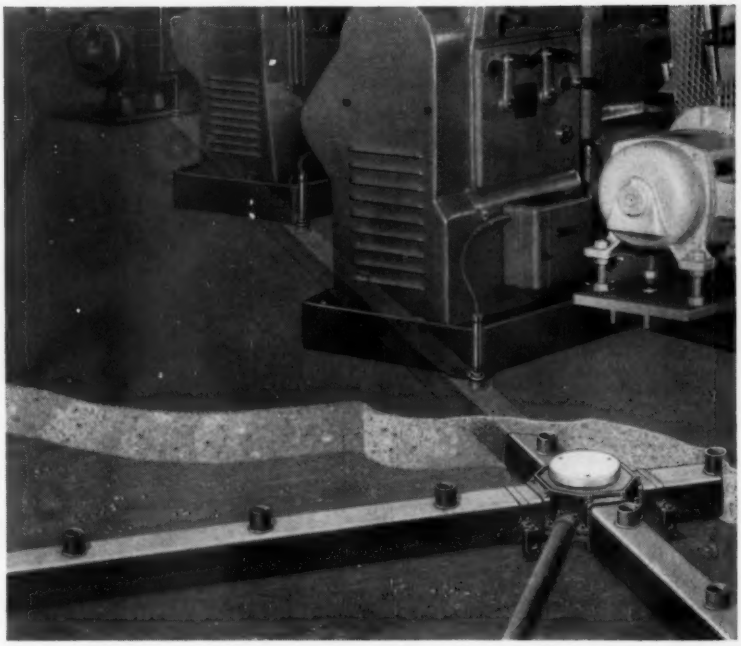
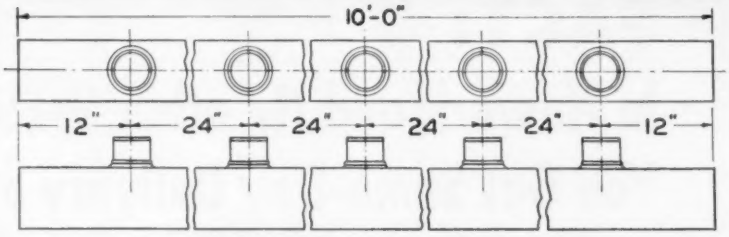
2″ pipe threaded outlets every 24″ permit exact location of equipment for most efficient production layout.

Low Cost

Furnished in easy-to-handle 10′ lengths (complete line with junction boxes and a full complement of fittings), JUMBODUCT can be quickly installed in the same simple manner as standard Nepcoduct.

Close proximity of inserts to finished floor makes access quick and economical. Investment in conductors is limited to today's need with ample area for tomorrow's expansion.





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JUMBODUCT, protected against corrosion by Sherardizing plus a baked-on coating of acid-resisting enamel, is a completely grounded all-steel electrical system for protection of personnel and equipment.

Get the details on National Electric's newest all-steel, completely grounded industrial underfloor raceway. Write today for a free Engineering Data Book on NE JUMBODUCT.

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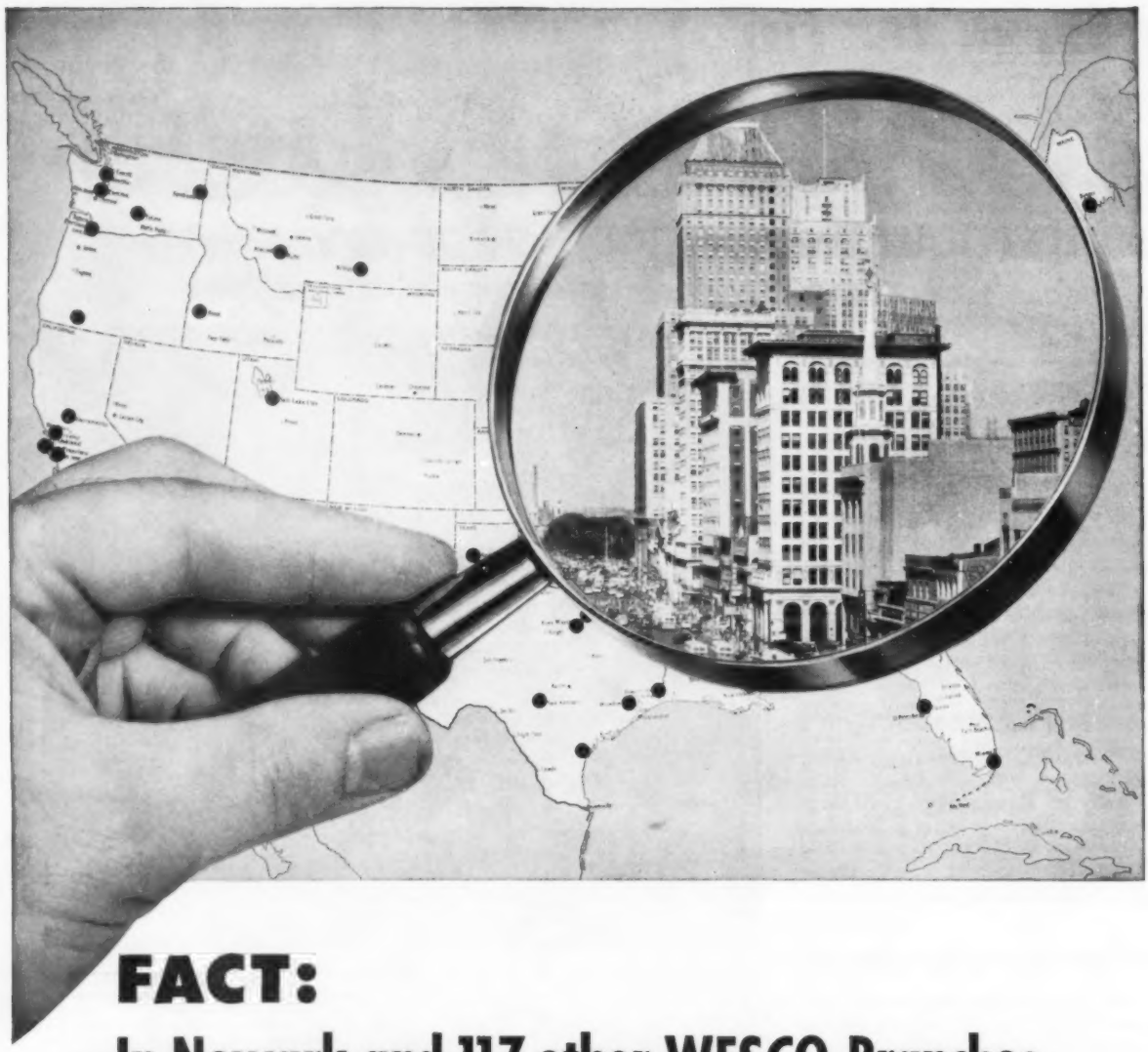

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WESTINGHOUSE ELECTRIC SUPPLY COMPANY

Questions on the Code

Answered by

B. A. McDONALD, *New York Board of Fire Underwriters, Rochester, N. Y.*
GLENN ROWELL, *Electrical Engineer, Fire Underwriters Inspection Bureau, Minneapolis, Minn.*
B. Z. SEGALL, *Consulting Electrical Engineer, New Orleans, La.*

Conduit Fittings

Q. *What recognition does the Code or the Underwriters' Laboratories have concerning "condulets" or "unilet" type of fittings? The fittings often do not have sufficient room inside them for the bending radius recommended by the wire manufacturers. Example: 500 MCM type R recommended bending radius is 4 in. (source: General Electric), yet this radius would be difficult to attain in a 3-in. condulet, if not impossible. Suggest that such fittings be required to be designed so that minimum bending radii for three of the largest conductors for each size is built into the fittings.*—R.E.C.

A. This has been a moot question for some time. Section 3708a3 and Section 3709c specifically exempt conduit fittings of the type you mention from all the necessary dimension requirements set up for pull boxes, etc. There has been much complaint from the field because of the use of these fittings especially with large sizes of wire such as you point out in your example.

The answer of course, is for the designing engineer to call for proper sizes of pull boxes as per the requirements of Section 3708. The absence of a properly qualified engineer precludes this solution.

Some manufacturers have recognized this problem and are now offering an oversize fitting, viz., Appleton and Crouse-Hinds "Mogul" line. Some are going a step further and are furnishing domed covers.—B.Z.S.

Substations

Q. *A new 4-story building is being served by 13,800 volts from an underground network and the plans call for substations in the basement on second and fourth floors. As these transformer vaults are one above another, we would like to serve the vaults on second and fourth floors from the vault on the first floor with bare bus bars due to the fact that it is entirely probable capacities will have to be increased materially if present plans for production in this plant develop. Would such an installation be in conformance with Code requirements?*—N.B.L.

A. If the incoming primaries enter the basement vault and terminate there in both switch and overcurrent protective devices and then extend to the transformer banks in the three separate vault locations, it would be permissible to extend feeders to the transformer rooms on second and fourth floors by means of open bare bus providing that bus was in a location accessible only to qualified persons and was in an area which would be considered dry. You will find this permission under Section 7105 of the Code where it states that circuit conductors shall be suitable for the voltage and the conditions under which they are installed. They shall be installed in rigid metal conduit, in raceways or ducts or as open runs of metal armored cable suitable for the purpose and use except that in locations accessible to qualified persons only, open runs of non-metallic sheathed cable, bare conductors and bare bus bars may also be used. Then under section 2389 you will find the type of overcurrent protection required on the incoming service and in Tables 32 and 33 you will find the distances required for isolation by elevation for working space.—G.R.

Hermetic Type Motor Protection

Q. *We have made laboratory and field studies of condensing units on farm bulk milk tanks and find that many of the compressor motors are apparently overloaded at definite periods during the process of cooling the milk. On units with a separate compressor motor, we have based our findings on the watts input to the motor, the nameplate rating of the motor, and the requirements of the Code. Under these conditions, there appears to be considerable difficulty in meeting code standards for motor protection. Some semi-sealed units have presented more of a problem as the nameplates for the motors did not carry as complete a description of the motor characteristics.*

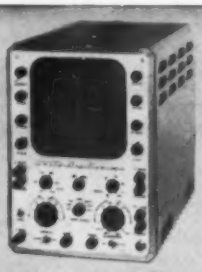
One motor manufacturer is not at all perturbed that several of his motors were overloaded well beyond the nameplate ratings including the service factors. Another manufacturer has stated that semi-sealed unit motors are permitted a watts input much greater than would be indicated by the nameplate hp rating.

We want to be sure that our interpretations are correct and would appreciate any information that you can give us on the loads permitted on comparable size separate and semi-sealed condensing unit motors—say a nameplate rated 1.5-hp.

Perhaps a couple of questions will be of some help. Should code current overload protection requirements be applied to nameplate ratings of semi-sealed units and to separate motors when used with refrigeration compressors? What is your opinion on the proper use of the service factors of motors used on rural lines?—L.F.C.

A. In order to express an opinion on the questions you have raised I will endeavor to point out the various Code rules which are involved with the overcurrent protection of motors as they apply to general motor applications as compared with sealed (hermetic type) refrigeration compressor motors. Section 4301 defines the latter as follows: "A sealed (hermetic type) refrigeration compressor is a mechanical compressor consisting of a compressor and a motor, both of which are enclosed in the same housing, with no external shaft nor shaft seals, the motor operating in the refrigerant atmosphere". It is evident that a motor which operates in an ambient temperature considerably below that usually encountered will be able to deliver more hp without damage, from overheating, to the motor. As a result the Code recognizes this fact and makes the following distinctions between these two motor applications.

Section 4304 a-b which covers the identification of motors, as shown by Fig. No. 1, general motor applications are required to have a nameplate,



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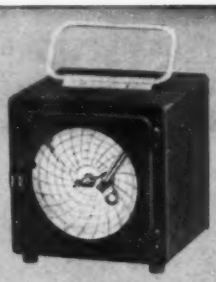

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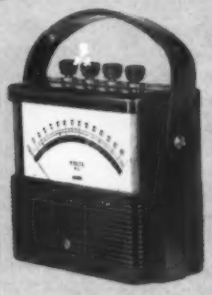

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Fig. No. 1

Identification of Motors. 4304

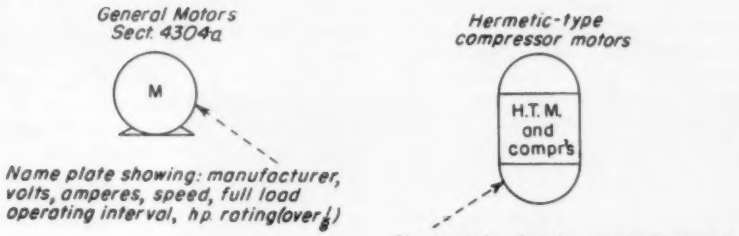
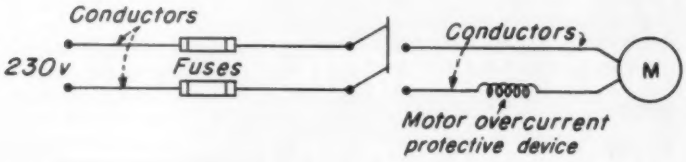


Fig. No. 2

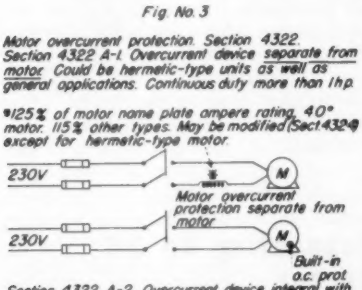
Current-Carrying Capacities

Section 4309-A. General Applications. Size of conductors, switch, fuses determined in line with h.p. ratings and corresponding current values given in Tables 21-24 of Chapter 10. Motor running protective device based on nameplate current rating.



Section 4309-B. Hermetic-Type Refrigeration Motors. Size of conductors, fuses and motor running protective device shall be selected on basis of name plate full load current. Size of switch and controller: See Section 4383 G and 4403.

Fig. No. 3



showing the manufacturer, volts, amperes, speed, full load operating interval and the hp rating ($\frac{1}{8}$ hp or larger). In the case of the sealed refrigeration compressor motor the nameplate must show in addition to the manufacturer and the voltage, the phase, frequency and the full load current in amperes (operating current at rated output) and if a protective device integral with the motor is used it must be so indicated on the motor. It is important to note that no hp rating is required.

Section 4309 a-b covers the current-carrying capacities of the conductors, overcurrent devices and switches which are required when either application is used. In the case of general motor applications these values are determined on the basis of hp ratings with corresponding current values given in Tables 21-24 of Chapter 10. The motor overcurrent devices must be determined from the nameplate current rating. (See Fig. No. 2). In the case of the hermetic-type refrigeration compressor motor, however, these values must be determined from the nameplate full load current rating. You cannot use Tables 21-24 of Chapter 10 as recognized for general motor applications.

Section 4322 covers the overcurrent protection of continuous duty motors, rated at more than 1 hp. By the use of Fig. No. 3, I have endeavored to clarify these requirements as they apply to general applications, hermetic type compressor motors or other motors that have protective devices integral with the motor. You will note that the only difference between the first two applications concerns the increase from 125% to 140%, as covered by Section 4323. This increased value for motor-running overcurrent protection is not recognized for hermetic type refrigeration compressor motors. When a protective device is integral with the motor, on either application, the question of overcurrent protection for the motor is determined by a device which is approved by Underwriters' Laboratories for the particular motor application involved. This device is responsive to motor current or to both motor current and temperature.

In view of the foregoing Code requirements, it appears to me that the 1.5 hp motor which is separate from the refrigeration compressor must have a nameplate showing the hp and amperes and the overcurrent protective device must be set at not more than 125% of 115% or 140% as covered by Section 4322 A-1. If this motor is a sealed (hermetic type) motor which operates in the refrigerant atmosphere it must have a nameplate showing phase, frequency and the operating current at rated output and the rating of the overcurrent protective device must be either 125% or 115% of this current rating as covered by Section 4322 A-1. If this motor is provided with a protective device integral with the motor which is responsive to motor current or to both motor current and temperatures, and is approved by U. L. for the motor application concerned, as covered by Section 4322 A-2, then the question of overcurrent protection is fully satisfied irrespective of any nameplate current rating shown.

Your question concerning service factors and your comments with respect to the determination of horsepower ratings were referred to the National Electrical Manufacturers Association and Mr. Mitchener who is their Ass't Manager for Engineering has commented as follows on these and the other points you have raised:

"In the first place, one thing that struck me in his letter was the fact that Mr. C is apparently determining overload by comparing watts input with the nameplate horsepower rating. The horsepower is, of course, an output rating, not directly correlated with his rating of watts input. He may have obtained some efficiency figures from the manufacturer, but these would apply directly only at rated load. Since watts input is not ordinarily a nameplate quantity, and since watts are not used in the Code in the determination of motor protection, I would advise Mr. C to avoid these readings for this purpose, and use current input instead. Perhaps doing so will eliminate some of the discrepancies.

"Perhaps it would also be worthwhile to point out to Mr. C that some hermetic compressor motors are normally run at a load and with an input greater than the motors could stand in conventional application without overheating. This is due to the fact that in this application the motor windings are surrounded by the refrigerant gas being returned from the evaporator, and this gas is, of course, still chilled. Perhaps Mr. C. does not know that this was the main reason behind the 1953 Code Revision that provided somewhat special rules for hermetic type refrigeration compressor motors, with the elimination of the horsepower rating as one of the required markings.

"The semi-sealed units, of which Mr. C. speaks, would generally come within the same classification as other hermetic type units, inasmuch as the definition given in Section 4301 makes no distinction as to whether the case is welded or bolted together, but provides as the criterion the fact that both the motor and compressor are in the same housing, and the motor operates in the refrigerant atmosphere. Perhaps some of the motors to which Mr. C refers were not overloaded, in view of this special cooling medium and the service involved.

"As you have pointed out in your letter to Mr. C, the determination of the proper motor running overcurrent protection is given in Section 4322-a of the Code. You have, however, emphasized the provisions of Paragraph A-1, which is the alternative for a separate overcurrent device responsive to motor current. Perhaps it should also be particularly pointed out that there is a second alternative given in Paragraph 2, which is the one permitting a protective device integral with the motor. If this type of device is applied, the specific percentages of motor full-load current rating do not apply, and the criterion is the prevention of dangerous overheating of the motor. Perhaps some of the motors which Mr. C has are provided with this type of protection.

"In your letter, you pointed out that the motor full-load current rating for the separate motors is as covered in Section 4309-a, and you seem to indicate that this applies to the semi-sealed units also. I believe, however, that if the semi-sealed units comply with the definition of sealed hermetic type refrigeration compressors, as given in Section 4301, then Section 4309-b, rather than 'a,' applies to this type. (I agree with this comment.)

"It might also be well to point out that the revision in the Code to provide special rules for hermetic type compressor motors is quite recent and that, as a result, some units obtained from dealers' stocks may have been rated and marked prior to the adoption of the new Code. This may be the reason for Mr. C. having observed that the markings were not all on the same basis.

"With respect to the question of the use of service factors of motors on rural lines, I do not believe that we have much more information than you.

"The application of service factors is indicated in the following authorized engineering information, quoted from the 'NEMA Motor and Generator Standards':

'A general-purpose motor or any motor having a rated temperature rise of 40 C continuous duty is suitable for continuous operation at rated load under the usual service conditions given in MGI-6.2. When the voltage (and frequency in the case of alternating-current motors) is maintained at the value specified on the nameplate, the motor may be overloaded up to the horsepower obtained by multiplying the rated horsepower by the service factor (see MGI-1.25) shown on the nameplate.

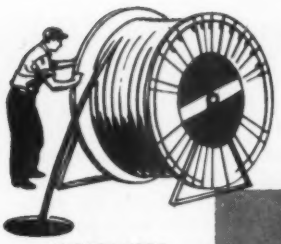
'When operated at this overload, the motor will have a higher temperature rise and may have different efficiency, power factor and speed than at rated load, while the locked-rotor torque and current and the breakdown torque will remain unchanged'.

"With respect to use on rural lines, perhaps the connection is that, as indicated in the above quotation, the service factor applies when the voltage is maintained at the values specified on the nameplate. Rural lines may be particularly subject to voltage drop, but for the relatively small motors on these refrigerating machines, perhaps the voltage drop in the branch circuit is of even more importance".—B.A.McD.

Connecting An Oil Burner

Q. *Is it permissible to use ¾-in. Greenfield for hooking up an oil burner?—P.K.*

A. Under Section 3503, you will note that flexible metal conduit less than ½-in. in trade size shall not be used except as permitted for underplaster extensions by Section 3442 and except as permitted for motors by paragraph b. of Section 4439 and, last, except where used for connections not longer than 48 inches in approved assemblies where it is impractical to use ½-in. or larger sizes of flexible metal conduit. In each of these three



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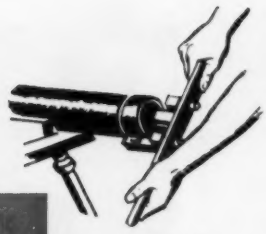

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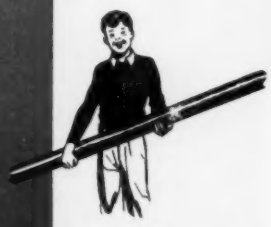

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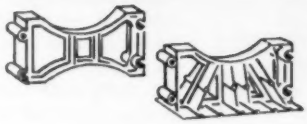

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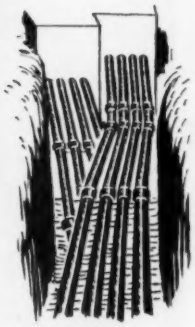

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instances it is permissible to use ⅜-in. electrical trade size flexible metal conduit.

Therefore, if the oil burner you are speaking of is simply a motor driven oil pump and blower and the conductors you will place in this ⅜-in. trade size flexible conduit are only the leads to the motor, you could use a piece of ⅜-in. flexible metal conduit provided it was not more than 6 ft in length and is properly connected to both the motor and to the box from which the motor receives its energy. As most oil burning furnaces have more than a single motor, it is, of course, necessary to use ½-in. or larger conduit to serve energy to them.—G.R.

Receptacles

Q. *Section 2123b states that two or more receptacles of 15-amp capacity can be connected to a 20-amp branch circuit. Is a duplex receptacle considered as two outlets? This situation occurs frequently in providing a single circuit to a ¾-ton window air conditioning unit, yet it is not desirable that a duplex outlet be installed because little more power may be extracted on the circuit without tripping the breaker.*—R.E.C.

A. There is no definite Code rule with respect to a duplex outlet. The definition for an outlet could be constructed so as to consider each outlet of a duplex receptacle, separately. However, by inference it is felt that each duplex receptacle can be considered as a single outlet. For example, 2116c3 considers each 5-ft length of multi-outlet assembly as one outlet. Some of these assemblies can be arranged with a duplex outlet for each six inches of assembly so in effect we are calling ten outlets a single outlet.

In the case of utilizing a circuit as you outline for a combination load of air conditioning and other loads you will run into trouble. First off the new Interim Amendment Section 4293 will only permit the air conditioning load to be a maximum of 50% of the branch circuit rating. Thus, a ¾-ton, 120-volt unit with its average rating of about 13 amp would require a combination branch circuit rating of at least 13/.5 or 26 amps. This would be a 30-amp branch circuit. Such a circuit can only supply appliances in any occupancy and only fixed lighting units in any occupancy other than a dwelling.

So in effect we are more or less compelled to go to a single outlet branch circuit. For the case where a single outlet is used this Interim Amendment limits the air condition-

ing load to 80% of the branch circuit rating, viz., 13/.8 or 16¼ amps. Therefore, a 20-amp branch circuit with only a single outlet must be used. It is true that there is a reserve of 20-16¼ or 3¾ amps in this circuit, but the Interim Amendment specifically states that the "branch circuit . . . does not supply lighting units or other appliances".

If the units are 220 volts rating, the nominal current rating will be about 6 amps. It is possible under these conditions to use two or more outlets following the above outline of design. —B.Z.S.

Service Disconnect—Handle Ties Etc.

Q. *Section 2351 of the Code recognizes the disconnecting means for a service to consist of many two or three single-pole switches or breakers, capable of individual operation to be grouped on multi-wire circuits as one multi-pole disconnect, provided they are equipped with "handle ties", "handles within 7s-in. proximity", a "master handle", or "other means" making it practicable to disconnect all conductors of the service with no more than six operations of the hand. This indicates that we may have, on a 3-phase, 4-wire wye service as many as 40 or 50 disconnecting means and in the case of circuit breakers the same number of overcurrent devices. It appears that this provision conflicts with Section 2371 which limits the number of overcurrent devices to six. Would it be a violation of the Code for me to accept more than six circuit breakers as above permitted?—E.I.*

A. As far as the intent of the Code is concerned, I do not believe there would be any violation. A literal reading of this provision leaves a question. There appears to be, as you say, a conflict. Section 2371-a-3 very definitely limits the number of overcurrent devices to six and Section 2351 recognizes more than six such devices. I believe the question which you have raised should be clarified by an additional exception under 2371-a which would recognize the exceptional conditions under which more than six overcurrent devices could be used. I do not agree however that 50 circuit breakers could be used since all of the breakers would be mounted in one service cabinet and the number of overcurrent devices would be limited to 42 as covered by Section 3882. We could however, as an example, on a 3-phase, 4-wire, wye service have a service panel with 14 circuit breakers per phase, a total of 42 breakers acting

as the service disconnect provided the conditions outlined in your question were satisfied. I do believe the conflict which you have detected should be eliminated.—B.A.McD.

Transformer

Q. *To provide energy for the control circuits of several motors, may we use a single transformer?—J.P.*

A. Under Section 4374 you will note the following: "If a transformer or other device is used to obtain a reduced voltage for control circuits, such transformer or other device shall be connected to the load side of the disconnecting means." Therefore in your case, if you have a single disconnecting switch serving the group of motors in question, it would be possible to use a single transformer connected to the load side of that disconnecting means to serve as a source of energy for all control circuits for those motors. You will also note under Section 4410 conditions under which more than one motor may be served by a single disconnecting means.—G.R.

Motors on a Production Line

Q. *A new production line is being installed in a plant which will have a total of 75-hp of motors but due to the type of operation, not more than 55-hp of motors will be operating at any one time. Will it be necessary in running feeders and mounting a distribution cabinet to figure feeder sizes on the 75-hp motor total, or may we calculate these feeder sizes from the 55-hp total? The largest motor used on this production line will be a 5-hp motor.—H.C.*

A. If the operation of this production line is such that it is not possible for all motors to operate simultaneously, you will find under Section 4316 of the Code the following permission:

"Where a reduced heating of the conductors results from motors operating on duty-cycle, intermittently, or from all motors not operating at one time, the authority enforcing this code may grant permission for feeder conductors to be of a capacity less than specified in the sections 4314 and 4315, provided the conductor is of sufficient carrying capacity for the maximum load determined by the sizes and number of motors supplied and the character of their loads and duties."—G.R.

Ambient Temperature Rating

Q. *Conductors are rated from an ambient temperature of 30C (86 F). Molded case circuit breakers are rated from an ambient temperature of 25 C (77 F). This results in necessary derating of the circuit breaker with relation to the wire insulation. Why are they not based on the same ambient so breaker capacities can be more nearly conductor capacities?*—R.E.C.

A. There is seemingly some discrepancy in this basis for ambient temperature rating. However, I do not know if anyone actually derates the breakers because of this fact.

The Code, however, does require the breaker or for that matter any overcurrent device, to be derated 80% for continuous loads. Also, I believe most design engineers design their circuit loading so as to keep the total connected load well below the capacity of the breaker (or fuse, etc.).—B.Z.S.

Conduit for Combination of Wire Sizes

Q. *What size conduit would you use for new work if you were using TW wire and had three 500 MCM and one 4/0?*—R.M.

A. Even though you are using a thinner insulated conductor you must use the values shown in Column 3 of Table 13, Chapter 10 for designing conduit runs for new work. The final fine print note at the bottom of this table clearly states this requirement.

Therefore, we obtain the following areas for the two wire sizes:

500MCM	.9834 sq in.
4/0	.4840 „

Total area—

500 MCM—3 x .9834 or	2.9502 sq in.
4/0—	.4840
Total area of wire	3.4342

Table 11 shows for non-leaded conductors in the first line for four conductors a maximum fill of 40%. Therefore, the above area of wire cannot be more than 40% of the minimum conduit area used, so

The minimum conduit area is 3.4342/.4 or 8.5855 sq in.

Table 12, Column 3 shows a 3-in. conduit to have 7.38 sq in. and a 3½-in. to have 9.90 sq in. We must use the 3½-in. size so as not to exceed the 40% fill requirement.—B.Z.S.

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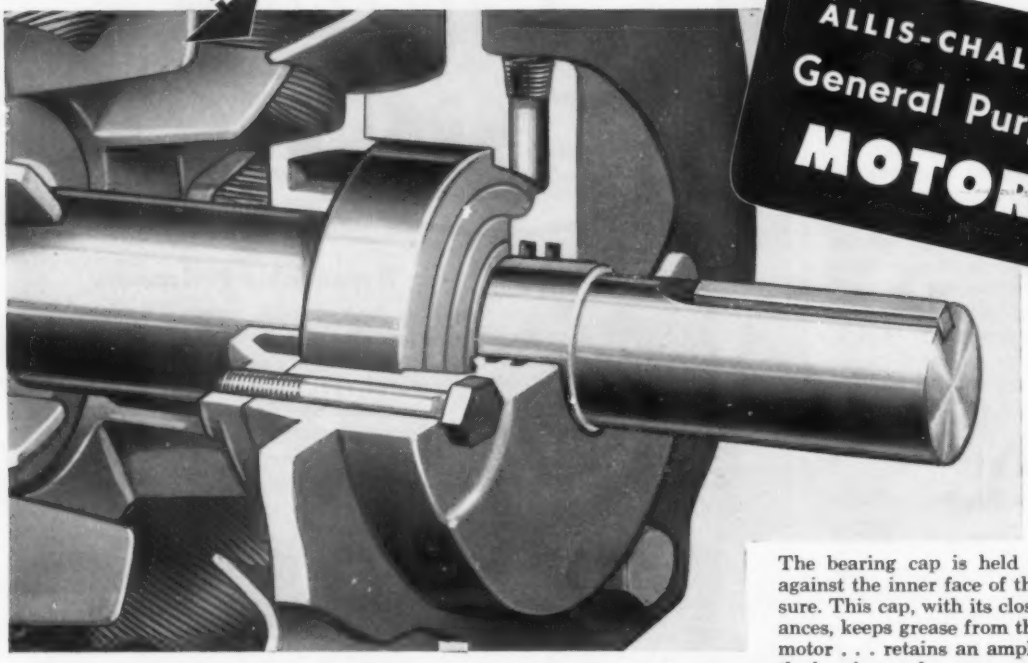

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The bearing cap is held tightly in place against the inner face of the bearing enclosure. This cap, with its close running clearances, keeps grease from the interior of the motor . . . retains an ample supply within the bearing enclosure . . . protects the grease and the bearing against contamination from dirt and moisture.

At the outer side of the bearing, double labyrinth seals keep grease in, also keep dirt out. What's more, large grease reservoirs act as additional dirt traps.

. . . yet easy to grease

You can lubricate the bearings without dismantling the motor. Pipe-tapped holes in the bearing housings at two points provide both means for inserting new grease and a means of flushing out old grease.

Look for the extra bolts on the end housing . . . the sign of greater value. Ask your Allis-Chalmers representative or Authorized Distributor to show you a cutaway section of this maintenance-cutting design. Or write Allis-Chalmers, Milwaukee 1, Wisconsin, for Bulletin 51B6210.

A-4608

ALLIS-CHALMERS

In The News

Electricity from Atoms Feeds Utility Lines

For the first time in history elementary atomic forces of the universe, tamed and converted to useful electricity, powered the lights, motors and appliances of an American community at West Milton, N. Y. On July 18 at 3 P.M., Admiral Lewis L. Strauss, chairman of the Atomic Energy Commission threw a switch which sent 10,000 kw of electricity from an atom-powered generator into the distribution system of the Niagara Mohawk Power Corp.

Energy source was the prototype reactor for the U. S. Navy submarine "Seawolf" under experimental operation in a 225-ft diameter steel sphere at West Milton, N. Y. The reactor was developed at the Knolls Atomic Power laboratory by the General Electric Co. for the A.E.C.

Uranium atom fission in the reactor produces heat. Liquid sodium metal flowing through the reactor transfers the heat to a heat exchanger. The exchanger converts water to steam which is piped to the adjacent turbine-generator for the production of electricity.

A 12,500 kw turbine-generator, direct condensing type, and its associated equipment and switchgear convert the energy from the reactor steam output to electric power at the required voltage and frequency to feed the utility line. Under the direction of the General Electric Real Estate and Construction Services Department, the Bechtel Corporation made the installation in 17 days.

Ralph J. Cordiner, president of General Electric, at the energizing ceremony, described the event as "proof to the world—that the atom is an instrument for peace and plenty".

"Here are the simple facts concerning this significant event", he said. "Under contract from the United States Government, the General Electric Company has developed and built a prototype reactor of the type that will drive the atomic submarine Seawolf. This reactor is housed in a huge steel sphere you see before you.

"The General Electric Company proposed to the Atomic Energy Commission that this installation—through the addition of over a million dollars worth of power generation equipment and at no expense to the government—be utilized for generation of electricity, and that the electricity be sold—at no profit to the Company—for use in home and industry. The Atomic Energy Commission accepted and supported this proposal.

"General Electric has installed this generation equipment, with the cooperation of the Navy and the Atomic Energy Commission, in order to demonstrate for the first time in America, the *actuality* of producing atomic electricity for home and industry.

"In this way, General Electric, the Atomic Energy Commission and the Navy hope to give proof to the world and America that the atom is an instrument for peace and plenty."

Admiral Lewis L. Strauss, chairman, U. S. Atomic Energy Commission, described present progress in atoms-for-power. "In a matter of minutes now", he said, "the homes and industries of this part of the nation are to receive several thousand kilowatts of atomic electric power.

"In two years or less, our first *full-scale* plant to produce electrical power from atomic energy will be supplying 60,000 kilowatts of electricity to the Pittburgh area. That plant, for which President Eisenhower broke ground last Labor Day, is under construction at Shippingport, Pa.

"American companies, and groups of companies, in various parts of the United States stand ready, as of now, to build six commercial atomic power plants with a total capacity of 765,000 kilowatts and have them completed within the next five years, at a total cost of nearly $250-million".

26 Scholarships Given by Joint Industry Board

The seventh annual award of college scholarships was made on June 25 to 18 boys and eight girls, sons and daughters of members of Local 3, International Brotherhood of Electrical Workers, A.F. of L. by the Joint Industry Board of the Electrical Industry of New York at a breakfast ceremony in the Waldorf Astoria, New York.

Dr. Harry J. Carman, dean emeritus of Columbia College and newly appointed educational adviser to the Joint Industry Board, presented the 26 six-year scholarships, each valued at $5,280, the largest number in the history of the program. In the six previous years 42 similar awards have been made to children of electrical workers.

Next September the 1955 winners will enter Barnard College, Columbia College, Fordham University and New York University for study leading to careers in electrical engineering, medicine, dentistry, teaching, law, social work and business administration. This is the first year that winners may attend Fordham and New York University as well as Barnard and Columbia. The scholarships are provided under a labor-management agreement by which each affiliated electric concern doing more than $1,000,000 of business in any given year sponsors a scholarship.

RETIRED CHIEF electrical inspector of Chicago, David J. Talbot (left) receives plaque and one-thousand dollar U. S. Savings Bond from Lou Matson, president, Cook County Electrical Contractors Association, Chicago, at testimonial dinner honoring Talbot for his 40 years of service in the electrical inspection department. Dinner was sponsored by the Cook County contractor group and attended by electrical industry leaders throughout the Chicago area.

Hogan Heads Chicago Electrical Inspectors

William P. Hogan, Jr., is the new Chief Electrical Inspector of the City of Chicago following certification by the Electrical Inspection Bureau. He won the top post by placing first in competitive Civil Service Examinations for both Chief and Assistant Chief Electrical Inspector. Hogan succeeds D. J. Talbot who retired after 40 years of service with the Bureau.

Mr. Hogan's background and train-

ing has been in the electrical field. He studied electrical engineering at the Illinois Institute of Technology and enlisted in the Navy as electrician Third Class in January 1942. Following his release from the service in November 1954 as Chief Electrician's Mate, he specialized in electrical circuit design and operation. He was certified as an electrical inspector with the City in September 1954.

New York State Contractors Meet

"Progress and Safety Thru Adequacy" was the theme of the 56th annual convention of the New York State Association of Electrical Contractors and Dealers, Inc. held June 28 to July 1 at Saranac Inn, N. Y. Over 400 attended the convention.

The first day was "Contractors Day" and A. Lincoln Bush of New York City was chairman. William L. Drexler, president and convention chairman, gave the address of welcome.

S. J. Cristiano, director, Field Service, NECA District No. 1, spoke on "The Employer-Employee and Adequate Wiring". He reported that 78% of the existing dwellings are inadequately wired and that the annual kilowatt hour consumption in the home has increased 55% in five years.

"Safe Electrical Wiring" was discussed by James D. Lynett, state superintendent, Bureau of Electricity, New York Board of Fire Underwriters, New York.

The final speaker of the day was Herman L. Weisman, counsel, New York Electrical Contractors Association of New York, whose topic was "Public Policy and Adequate Electrical Wiring". Mr. Weisman emphasized the need for public protection in the proper design, engineering and supervision of safe wiring installations.

Howard B. Wakeman, vice president, Long Island Lighting Co. acted as chairman on "Utilities Day".

James O. Covington, manager, Adequate Wiring Bureau, Consolidated Edison Co., New York, stated that the goal of Con Edison's Adequate Wiring Program has been to educate the public to the need for, and benefits of, Adequate Wiring.

"Banks and Savings and Loan Associations will lend money for rewiring whether it is on a one-family house or a multi-tenant building scale," he said. "In fact, mortgage lenders will write bigger mortgages on new properties in which adequate wiring has been installed. Since we started our wiring promotion 10,487 one and two-family houses totalling 13,977 dwelling units

Line patrol. The Universal 'Jeep' carries patrol and service crews and equipment along the right of way to structures in off-road locations. It travels in conventional 2-wheel drive at highway speeds, but shifts easily into 4-wheel drive for extra traction to go through mud, soft earth, sand or heavy brush—or climb steep grades—where other vehicles can't go.

How 'Jeep' vehicles cut costs on construction and service jobs

Maintenance. The 4-wheel drive 'Jeep' Truck takes repair crews and equipment wherever they're needed, on or off the road. With the extra traction of its 4-wheel drive, it gets through to trouble spots when storms or other emergencies knock out service.

Trenching. The 'Jeep'-propelled trencher digs up to 800 feet of clean-cut 6-ft. deep trench per hour, to speed the installation of cable, conduit and service lines. Unit travels at highway speeds between jobs.

From line installation through maintenance and other service activities... the electrical industry is served on job after job 24 hours a day by 4-wheel drive 'Jeep' vehicles.

With the extra traction of their 4-wheel drive, 'Jeep' vehicles take crews and equipment off the road, right to the tower or substation, wherever service is required.

'Jeep' vehicles with power take-off operate a wide range of equipment, including generators... compressors... mowers ...post hole diggers... winches... and many more.

Learn how the electrical industry uses multi-purpose 'Jeep' vehicles for hundreds of different jobs, from installing meters to stringing high lines, and how these vehicles save owners money through long life and low maintenance costs. See your Willys dealer today, or write for information.

The 'Jeep'®

family of 4-wheel drive vehicles

WILLYS... makers of the world's most useful vehicles

WILLYS MOTORS, INC., TOLEDO 1, OHIO

has been rewired in our area.

Arthur C. Sugden, assistant engineering manager, Long Island Lighting Co., Mineola, discussed Long Island's interest in atomic power. He stated that at the present time the Long Island Lighting Company has assigned an engineer to work full time with the Nuclear Engineering Department of the Brookhaven Laboratory on some of the problems associated with the development of the LMFR reactor. The Long Island Company is associated with the Atomic Power Development Associates. The ultimate goal of the APDA is the design, development and construction of a fast breeder liquid metal fueled reactor, using plutonium as a fuel.

On Manufacturers and Wholesalers Day, Willard G. Henges, president of Graybar Electric Co., acted as chairman.

The first speaker was Harold A. Olson, commercial vice president, General Electric Co., New York, who spoke on "Adequacy and Safety in the Home of the Future".

Mr. Olson stated that today the average yearly consumption of power for residences is 2500 kwh. A conservative estimate by utilities is for 5000 kwh by 1965. General Electric has scheduled for marketing in 1956, the electric kitchen center. G.E.'s new electronic oven, to be introduced next year, will cook with high frequency radio waves. In the home of the future, the trend will be to heat pumps for heating and cooling.

"Adequacy and Safety in the Plant of the Future" was discussed by Robin S. Kersh, vice president, Northeastern Region, Westinghouse Electric Corp., New York. Mr. Kersh spoke of the factory of the future and said that this factory will be windowless and mostly one-story high, on the edge of metropolitan areas. By 1965, the energy used by the coming factory will amount to 12 kwh for each man-hour of labor.

N. J. MacDonald, president, Thomas and Betts Company, Elizabeth, N. J., spoke on "Adequacy and Safety—What To Do About It" and stressed the necessity for advertising.

On the final day of the convention the following officers were elected—president, W. L. Drexler, New York, N. Y.; 1st vice president, H. F. Janick, Rochester, N. Y.; 2nd vice president, H. A. Webster, New York, N. Y.; treasurer, R. J. Knoblock, Syracuse, N. Y.; financial secretary, Russell Pattengell, Brooklyn, N. Y.; and recording secretary, J. M. Smith, Cohoes, N. Y.

HAROLD J. VORZIMER, vice president, Federal Pacific Electric Co., Newark, N. J. and James F. Burns, electrical contractor, Schenectady, N. Y., attended the annual convention of the New York State Electrical Contractors and Dealers, Inc., at Saranac Inn, N. Y.

A. LINCOLN BUSH, Belmont Electric Co., New York and S. J. Cristiano, NECA, New York attended the District No. 1 meeting in Manchester, Vermont and the convention of the New York State Electrical Contractors and Dealers, Inc. at Saranac Inn, N. Y. Both meetings were held in June.

NECA Districts 6 and 8 Hold Conference

Again the labor relations workshop, first tried last year at the Reno joint conference, was a highlight of the San Francisco joint conference of National Electrical Contractors Assn. Districts 6 and 8, May 26-28, attended by about 140 contractors plus their wives. W. R. Grasle of Portland, vice-president District 6, and W. P. Robbins, Salt Lake City, vice-president District 8, alternated in presiding over the sessions.

Significant items briefly stated were:

Labor relations—Ten changes to the national benefit (pension) rules will be submitted to the board of governors of NECA in June. These would increase the scope of coverage to utilities and other employers of IBEW in order to increase the fund. Representation on the boards would be provided.

G-E Type CLF fuses are available in a complete range of low-voltage (600 volts and below) applications where high interrupting capacity is needed.

Fused Safety Switch

Fused Combination Starter

HIGH INTERRUPTING CAPACITY FUSES FOR LOW-VOLTAGE POWER CIRCUITS

Are you sure that your fuses are adequate to clear any short circuit?

As industrial and commercial power systems have grown in size, the short-circuit capacity of many circuits has become so great that conventional fuses can no longer provide adequate protection. A few years ago short circuits were usually between 5,000 and 15,000 amperes. Today, these short circuits may soar as high as 30,000 to 100,000 amperes.

You can't afford to take chances when it costs so little to have adequate fusing—and when the results of inadequate protection can be so costly. Using fuses with inadequate interrupting capacity can result in unnecessary service interruptions, damage to equipment and injury to personnel.

The silver-plated CLF fuse will fit any standard NEC fuse holder of the same voltage and current rating. However, special fuse clips are available which will accept only the CLF fuse. Their use is recommended to prevent inadvertent substitution of conventional fuses having inadequate interrupting capacity.

Fuses are available from your local G-E Apparatus Distributor. For more information, send the coupon below for bulletin GEA-6319, General Electric Company, Schenectady 5, N. Y.

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GEA-6319, TYPE CLF CURRENT-LIMITING FUSES.

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STREET .....

CITY ..... ZONE ..... STATE .....

A vote in favor of the proposed changes to the Bacon-Davis Act and against those opposed to the Taft-Hartley Act.

Resolution passed, urging NECA headquarters to seek help of IBEW to promote subcontracting among general contractors now holding international agreements that permit them to hire their own electricians.

Antitrust—Warning from Paul Geary, executive vice-president, NECA, that the Department of Justice is taking a tough attitude and going to get tougher about anti-trust violations.

Business development—Tremendous potential market in home modernization of wiring systems, over $7,000,000 worth in the two districts' area, as pointed out by Howard Farley, sales promotion manager, NECA. John S. Walsh, Pacific Gas and Electric Co., described a successful sales and technical training program in the San Francisco Bay area.

Line construction—A sales program, aimed at the utilities, offering to relieve them of peak construction problems by contracting line work rather than building up temporary crews for peak work.

Codes and standards—Request to manufacturers of wire to standardize on a new TWH with coatings capable of use at 75 C down to −35° and elimination of vast numbers of in-between sizes and coatings. Request manufacturers of switches for ratings more realistic to the wire sizes and use rather than the present overrating.

Supplies—Two resolutions, one to seek joint meetings with suppliers to discuss policy troubles; the other to have NECA explore the feasibility of setting up a mass purchasing office at national headquarters because of the unstable conditions in the local supply and distribution situation.

CHARLES H. PRINDLE, Nyack Electric Co., Nyack, N. Y. and A. V. Bartlett, Sr., Rust Electric Co., Providence, R. I., were very active participants in the District No. 1, NECA annual meetings held at Equinox House, Manchester, Vt., during the early part of June.

District 1 NECA Held Conference in Vermont

The 9th annual meeting of District No. 1, National Electrical Contractors Association, was held at Equinox House, Manchester, Vt., on June 5-7. Approximately 275 members and guests registered from the New England States, Connecticut, New Jersey and New York.

A. V. Bartlett, Sr., vice president of NECA reported on the various activities of the District during the past year.

D. B. Clayton, president of NECA spoke briefly on conditions in the construction field, pointing out that this year there is an indicated increase in construction of some 13%.

Peter J. Hicks, Jr., public service engineer for the city of Providence, discussed the electrical inspector and the National Electrical Code, giving some historical background on the development of the Code. He said that every effort should be made to extend the application of the Code wherever electricity is being used; and to enforce the application of its provisions by appropriate legislation. He also said that the laws governing the licensing of electricians should be made stronger and rigidly enforced.

Mr. Hicks outlined the many duties of an electrical inspector and his many contributions to the good of the public and the electrical industry. He pointed out that his income is considerably below the earnings of a journeyman electrician. He urged that the inspector be given the recognition and compensation to which his skill, ability and work entitle him.

Paul Geary, executive vice president of NECA gave a progress report on the work of the Association during the past year, commenting on the high level of business volume; the large amount of residential, commercial and industrial modernization work available; low-cost bidding; anti-trust violations; status of Senate Bill 1644.

Others from the National headquarters of NECA who spoke were Bill Damon on apprentice training; Al Cornish on codes, standards and cost data; Howard Farley on governmental affairs and business development; and W. D. Howell from the National Electrical Benefit Fund.

The session on the second day was a forum on speakers' topics and Charles H. Prindle, chairman of the convention, was the moderator.

At the banquet an honorary life membership in NECA was presented to Louis Kalischer of Brooklyn.

The hosts for the convention were the Westchester-Fairfield and Hudson Valley chapters.

NISA News

Electrical Maintenance Equipment Co., Philadelphia, an Associate member of NISA, held open house for the Quaker City Chapter and others in the area in May. The firm recently moved into new quarters.

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The New York Metropolitan Chapter met May 19 at the Shelburne Hotel with 46 present. Bill Kauppert reported on the 10-man delegation he led to the Niagara Chapter meeting in Syracuse, N. Y. on May 6.

Meyer Friedkin reviewed briefly Frank Willey's new book, "Story of NISA", suggested that members read the book thoroughly and keep it for future reference.

Karl Meyertons, Jr. of Premier Electric & Eng. Co., New York, was welcomed back after a tour of military service. Walter Leirer announced the chapter's plans for a foremen's meeting in the fall. Brownell Distributors presented an Anaconda Copper film on copper production from mining ore to finished magnet wire.

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"One of the finest meetings we have ever had", according to chapter secretary Francis P. Sweeney, was held by New England Chapter May 12. Forty-five members, plus four guests, were present. During the business discussion, the group agreed to compile a list of manufacturers represented by members, the list to be available "for cross trading purposes".

A panel composed of Henry Noltee, Empire Electric Co.; Joe Piela, Piela Electric Co.; Al Allard, White Electric Co.; and Ed Kolhonen, Peabody Electric Co. discussed welding of broken shafts, V-shaft welding, worn shaft extensions and keyways.

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"Toss your troubles to the winds," advised Quaker City News, "and come to the annual dinner and ladies' night." The big event was held June 24 at Lu Lu Temple Country Club on Limekiln Pike in North Hills, Pa.

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Explanation of technical aspects of new rated motors and a demonstration of winding and inserting methods comprised the program of Central District Chapter (Chicago) May 10. The meeting, held at the Graemere Hotel, was of special interest to key shop men. The program was put on by Fairbanks Morse & Co.

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The annual Syracuse meeting of the

Niagara Chapter was held at the city's University Club, May 6. Hosts were Donald E. Murray of Murray Electric Co. and Larry Nelson of M. H. Salmon Electric Co. More than 40 members and guests attended including a delegation of ten from New York Metropolitan Chapter led by Meyer Friedkin of Electric Enterprise Co. Friedkin spoke briefly on ac motor rewinding of old frames, stressing conversion of small slip-ring motors from 6- to 4-pole.

New directors of the chapter were elected, including: Ralph Barker, new chapter president from Barker Electric, Niagara Falls, N. Y.; Fred Frosdick and Al Volland for 3-year terms; Larry Nelson, Cliff Nelson and Glen Wardell for 2-year terms; and Chet Tanner, Frank Egloff and Court Worth, 1-year each. The group also saw motion pictures on productive maintenance and atomic energy.

From Walter J. Prise, Queens Electric Motors, Inc., Jamaica, L. I., N. Y.

J. Scott Milne

J. Scott Milne, who rose to the presidency of the International Brotherhood of Electrical Workers (AFL) a year ago, after 36 years as a member and officer of the Union, died last month (July) of a heart attack. He was 57.

Just last May, Milne had been elected by AFL leaders to a post on the Federation's top-level executive council. He also served on the AFL Metal Trades Council.

Throughout his long labor career, Milne had a two-fold interest in promoting the Union cause. Besides holding down jobs from local business manager to international representative and then to secretary-treasurer of the IBEW, Milne was active in labor publications.

Following his elevation to the presidency in April, 1954, he continued as editor of the electrical union's monthly magazine—*The Electrical Workers Journal*—and as President of the International Labor Press of America. At AFL conventions, Milne was especially active in sessions dealing with the role of the labor press.

Milne, born in Canada in 1898 of Scottish parents, joined IBEW Local 125 in 1918. At that time he worked for the Portland Railway Light and Power Co., of Portland, Ore.

Shortly thereafter, he became acting business manager and financial secretary of the local, rising to international representative in 1925. He became an IBEW vice-president in 1929 and in 1947 took over as secretary-treasurer.

DATES AHEAD

Western Electronic Show and Convention—San Francisco, Calif., August 24-26.

Electrical Conference of the Petroleum Industry—Sponsored by the Petroleum Industry Committee and the Houston Section of the American Institute of Electrical Engineers, Shamrock Hotel, Houston, Texas, September 12-14.

Illuminating Engineering Society — National Technical Conference, Statler Hotel, Cleveland, Ohio, September 12-16.

International Association of Electrical Inspectors — Northwestern Section, Bellingham Hotel, Bellingham, Wash., Sept. 12-14; Southwestern Section, Mission Inn, Riverside, Calif., Sept. 19-21; Western Section, Nicollet Hotel, Minneapolis, Minn., Sept. 26-28; Southern Section, Jung Hotel, New Orleans, La., Oct. 3-5; Eastern Section, Mark Twain Hotel, Elmira, N. Y., Oct. 10-12; Canadian Section, King Edward Hotel, Toronto, Ontario, Canada, Oct. 21-23.

National Electric Sign Assn.—Annual fall conference, Sheraton Hotel, Chicago, Ill., September 15-16.

National Association of Electrical Distributors—Pacific Zone, annual convention, Empress Hotel, Victoria, B. C., Canada, September 25-28.

Electrical Progress Show—Convention Hall, Philadelphia, Pa., September 27-29.

National Electronics Conference — Hotel Sherman, Chicago, Ill., October 3-5.

International Association of Electrical Leagues — King Edward Hotel, Toronto, Can., October 5-8.

National Electrical Industries Show—69th Regiment Armony, New York City, October 11-14.

N. J. Council of Electrical Leagues—19th convention, Atlantic City, N. J., October 14-15.

National Electrical Contractors Association—Annual convention Waldorf-Astoria, New York City, October 31-November 4.

Fifth Industrial Electric Exposition—Hotel Wm. Penn, Pittsburgh, Pa., November 1-3.

National Electrical Manufacturers Assn. — Annual meeting Traymore Hotel, Atlantic City, N. J., November 14-18.

National Rural Electric Cooperative Assn.—St. Louis, Mo., January 23-26, 1956.

American Institute of Electrical Engineers — Winter general meeting, Hotel Statler, New York, N. Y., January 30-February 3.

Independent Electrical Contractors Assn., Inc. — Annual dinner and dance, Hotel Biltmore, New York, N. Y., February 11.

National Electrical Manufacturers Assn. — Edgewater Beach Hotel, Chicago, Ill., March 12-16.

Among the Manufacturers

Headquarters Announcements

Hubbard & Co., Chicago, Ill.—Lester W. Evers, assistant vice president.

Tork Clock Co. Inc., Mt. Vernon, N. Y.—H. F. Zuba, vice president; Dorset J. White, director of sales.

Pittsburgh Reflector Co., Pittsburgh, Pa.—Eric D. Altree, manager of new division producing Luma-Ceiling and church lighting equipment; H. D. Siler, manager of engineering dept.

Minnesota Mining & Mfg. Co., St. Paul, Minn.—J. J. McDonald, sales manager of electrical products to the contractor and maintenance trades.

National Electric Products Corp., Pittsburgh, Pa.—Thomas DeLutis, chief wire and cable engineer.

Ridge Tool Co., Elyria, Ohio—D. H. Rowe, assistant sales manager.

Rockbestos Products Corp., New Haven, Conn. is now a subsidiary of Consolidated Coppermines Corporation.

Bristol Company, Waterbury, Conn. —Ernest Nuber, general field sales manager.

Thomas Industries Inc. has relocated headquarters of all its divisions to Louisville, Ky.

Allen B. Du Mont Laboratories, Inc., Clifton, N. J.—G. Robert Mezger, general sales manager of the technical products division.

General Insulated Wire Works, Inc., Providence, R. I. has been acquired by the General Cable Corp.

United States Rubber Co., New York, N. Y.—H. Gordon Smith, vice chairman of the board and chairman of the executive committee; C. J. Noonan, member of the executive committee.

Knopp Inc. is the new name of the Oakland, California firm formerly known as Electrical Facilities Inc.

General Electric Co., Philadelphia, Pa.—Bertram W. Mahoney, general manager of the Industry Control dept.

Bogue Electric Mfg. Co., Paterson, N. J.—Ken R. Garlach, executive vice president.

Regional Appointments

NEW ENGLAND

Bulldog Electric Products Co.: Gordon J. McCormick, field engineer at Boston, Mass. office.

Peerless Electric Co., Fan & Blower Div.: Ray V. Norman, sales representative for New England, offices in Needham, Mass.

MIDDLE ATLANTIC

Stromberg-Carlson Co.: Metropolitan Sound Systems, Inc., distributor for metropolitan New York.

International Register Co.: Robert N. Clark, eastern regional sales manager.

Minnesota Mining & Mfg. Co.: Frank J. McGuinn, division sales manager of electrical products at the New York branch.

Cox and Co., Inc.: Sales engineers at Cold Spring Harbor, N. Y., R. W. Ayer; at Upper Darby, Pa., Malcolm A. Peckham; and at Hyattsville, Md., George A. Terpay.

SOUTH ATLANTIC

Kuhlman Electric Co.: Jay G. Gates, southern sales manager of the transformer division.

Gaines-Collins Co.: J. P. Schoenfeld, Richmond, Va., sales representative for northern half of North Carolina, Virginia, District of Columbia, and southern portions of Maryland and Delaware; Bert Lewyn, Atlanta, Ga. will handle sales in Georgia, South Carolina, and eastern Tennessee.

Elliott Co.: F. L. Humphrey, Jr., district manager of Atlanta, Ga. territory.

EAST CENTRAL

Graybar Electric Co., Inc.: J. J. Lieske, Jr., district sales manager at Chicago; E. W. Windahl, branch manager at Indianapolis, Ind.

Allis-Chalmers Mfg. Co.: W. B. Lawrence, manager of new sales district headquartered in Columbus, Ohio.

Complete-Reading Electric Co.: Ed Harrington, branch manager of new sales office and warehouse at 1437 St. Clair Ave., Cleveland, Ohio.

WEST CENTRAL

General Electric Co.: New apparatus service shop has been opened at 2809 N. Robertson St., New Orleans, La.

Electric Controller & Mfg. Co.: Clayton G. Findlay, district manager at St. Louis, Mo.

Rawlplug Co.: Jack Wilson, district sales manager for Oklahoma and northern parts of Texas and Louisiana, office in Dallas.

WEST

Markel Electric Products, Inc. and LaSalle Products, Inc.: Don H. Sluman, representative in Colorado, Wyoming, and Utah with offices in Lakewood, Colo.

Graybar Electric Co., Inc.: Doral Eardley, manager of the Fresno, Calif. branch.

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(Classified Advertising)

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Wanted graduate mechanical or electrical engineer with no more than 3-4 years' experience in steam electric generating plant, hydraulics, refrigeration, instrumentation, and lubrication engineering.

Will assist in planning, design and direction of 14 boilers, 18 mm. lbs.-a-day steam plant, 15,000 k.w. generating plant and 22,000 k.w. electric distribution system.

Excellent working conditions. Located in city of 70,000. Liberal company benefits. Five day, forty hour week. Please send complete resume to Personnel Department.

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All fixtures are union made, Underwriters Laboratory approved, Fleur-O-Lier certified and guaranteed for two years. We are licensees for various lens concerns. Prices are competitive and deliveries are prompt.

The type of representatives we are seeking must be familiar with the Electrical Wholesaler in his area and do field work with Electrical Contractors, Electrical Engineers and Architects for specification work.

Some choice territories available. All replies strictly confidential. Warehousing facilities will be given consideration.

Write or phone giving complete resume, lines carried, education, experience, references, etc.

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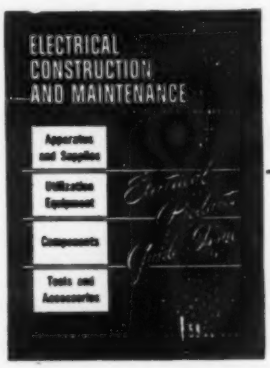

• These manufacturers advertised their products in the ELECTRICAL PRODUCTS GUIDE

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